California High-Speed Rail Authority

RFP No.: HSR 13-57

Request for Proposal for Design-Build Services for Construction Package 2-3

Reference Material, Part E.1 - Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
08ESMF00-2012-F-0247

APR - 1 2014

David Valenstein
Chief, Environmental and Systems Planning Division
U.S. Department of Transportation
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Subject: Biological Opinion on the California High-Speed Train System: Fresno to Bakersfield Section Project, Fresno, Tulare, Kings, and Kern Counties

Dear Mr. Valenstein:

This is in response to the Department of Transportation, Federal Railroad Administration (FRA), and the California High-Speed Rail Authority (Authority), the FRA's designated non-federal representative, September 18, 2013, request for administrative edits to the *Biological Opinion on the California High-Speed Train System: Fresno to Bakersfield Section Project, Fresno, Tulare, Kings, and Kern Counties*, dated February 28, 2013 (2013 FB-BO), and the October 8, 2013, letter requesting reinitiation of formal consultation with the U.S. Fish and Wildlife Service (Service) on the CHST-FB Project. The FRA determined that the proposed CHST-FB Project may affect, but is not likely to adversely affect the Fresno kangaroo rat, and requested the Service's concurrence with their determination. This document represents the Service's biological opinion on the effects of the action on the Federally listed as endangered San Joaquin kit fox (*Vulpes macrotis mutica*), Fresno kangaroo rat (*Dipodomys nitratoides exilis*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), blunt-nosed leopard lizard (*Gambelia sila*), the vernal pool tadpole shrimp (*Lepidurus packardi*), the California jewelflower (*Caulanthus californicus*), the Kern mallow (*Eremalche kernensis*), the San Joaquin woolly threads (*Monolopia congdonii*); and Federally listed as threatened central California Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*) (central California tiger salamander), vernal pool fairy shrimp and its critical habitat (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), Hoover's spurge (*Chamaesyce hooveri*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act). Critical habitat for the vernal pool fairy shrimp has been designated and occurs within the project action area, including the Fagundes Compensatory Mitigation Site

(FCMS). Critical habitat for the central California tiger salamander and the vernal pool tadpole shrimp has been designated and occurs only within the FCMS portion of the project action area. Critical habitat for the Fresno kangaroo rat, the valley elderberry longhorn beetle, and the Hoover's spurge has been designated but does not occur within the proposed CHST-FB Project action area. Critical habitat has not been designated for the San Joaquin kit fox, the Tipton kangaroo rat, the blunt-nosed leopard lizard, the California jewelflower, the Kern mallow, and the San Joaquin woolly threads.

This document represents the Service's biological opinion on the CHST-FB Project, and supersedes the February 2013 FB-BO. .

The Service has determined that the proposed FCMS component of the CHST-FB Project is not likely to adversely affect the vernal pool fairy shrimp and the vernal pool tadpole shrimp because the project, as proposed, will not result in harm to the cysts of these species. .

The Service has determined that the CHST-FB Project may affect but is not likely to adversely affect the designated critical habitat for the central California tiger salamander. This determination is based on the on the following:

1. We do not anticipate adverse effects from the CHST-FB Project to the Primary Constituent Elements (PCEs) within the portion of designated critical habitat that occurs within the FCMS.

2. The effects from habitat restoration activities proposed at the FCMS are expected to be temporary and occur over a short duration (less than 3 months).

The Service has determined that the CHST-FB Project, as proposed, may affect but is not likely to adversely affect the designated critical habitat for the vernal pool fairy shrimp. This determination is based on the on the following:

1. The portion of designated critical habitat for this species that occurs within the project action area is located outside of the project footprint and the 250-foot area on both sides of the CHST-FB alignment project footprint, where permanent effects to the hydrology of vernal pool habitat could occur. Therefore, we do not anticipate adverse effects to the PCEs of the designated critical habitat.

2. We do not anticipate adverse effects from the CHST-FB Project to the PCEs within the portion of designated critical habitat that occurs within the FCMS.

3. The effects from habitat restoration activities proposed at the FCMS are expected to be temporary and occur over a short duration (less than 3 months).

The Service has determined that the CHST-FB Project, as proposed, may affect but is not likely to adversely affect the designated critical habitat for the vernal pool tadpole shrimp. This determination is based on the on the following:

1. We do not anticipate adverse effects from the CHST-FB Project to the PCEs within the portion of designated critical habitat that occurs within the FCMS.

2. The effects from habitat restoration activities proposed in the CHST-FB Project are expected to be temporary and occur over a short duration (less than 3 months).

The Service agrees with the FRA's and the Authority's determination that the CHST-FB Project, as proposed, may affect, but is not likely to adversely affect the Fresno kangaroo rat. This biological opinion serves as our written concurrence with this finding. This determination is based on the on the following:

1. Existing populations of the Fresno kangaroo rat have not been identified within this portion of its historic range.

2. Potential habitat for this species is located outside of the recovery zones identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998).

3. The FRA and the Authority has proposed conservation measures to avoid take of the Fresno kangaroo rat.

This biological opinion is based on: (1) *California High-Speed Train: Fresno to Bakersfield, Potential Wetlands and Waters of the U.S.*, dated February 8, 2010; (2) *Fresno to Bakersfield Preliminary Jurisdictional Waters and Wetlands Delineation Report, Volumes 1, 2, 3, and 4*, dated June 2011; (3) *Fresno to Bakersfield Preliminary Jurisdictional Waters and Wetlands Delineation Report, Volumes 1, 2, 3, and 4*, dated June 2011; (4) *Draft Fresno Bakersfield Section Biological Resources*, July 2011; (5) *Draft Fresno Bakersfield Section Biological Resources and Wetlands Technical Report*, July 2012; (6) *Draft Fresno to Bakersfield Draft EIR/EIS, Volumes I, II, and III*, dated August 2011; (7) *Draft Fresno to Bakersfield Section Compensatory Mitigation Plan*, dated September 2011; (8) *Draft Fresno to Bakersfield Section Compensatory Mitigation Plan*, dated September 2011; (9) *Draft Fresno to Bakersfield Section Compensatory Mitigation Plan*, dated August 2012; (10) *Draft Fresno to Bakersfield Biological Assessment*, dated September 2011; (11) *Draft Fresno to Bakersfield Biological Assessment*, dated June 2012; (12) *Fresno to Bakersfield Supplemental Preliminary Jurisdictional Waters and Wetlands Delineation Report, Volumes 1, 2, 3, and 4*, dated July 2012; (13) *Revised Draft Fresno to Bakersfield Draft EIR/EIS, Volumes I, II, and III*, dated July 2012; (9) *Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS, Executive Summary*, dated July 2012; (14) *Assessment of the Use of Agricultural Lands by San Joaquin Kit Foxes* memo, dated February 7, 2013; (15) GIS data files; (16) *Assessment of Adequacy of Proposed Crossing Structures for San Joaquin Kit Foxes in the Biological Assessment for the Fresno-Bakersfield Segment of the California High-Speed Train* memo, dated February 9, 2013; (17) *Administrative Edits Memo*, dated September 18, 2013; (18) *Fresno to Bakersfield Supplemental Biological Assessment*, dated October 2013; (19) *Merced to Fresno Section – Inoculum Collection Methods for the HST PP1 Wetland Restoration at Lazy K Ranch*, dated December 13, 2013; and (20) other information available to the Service.

Consultation History

September 2009 to July 2012	The Service provided technical assistance to the FRA and the Authority through participation in meetings, electronic mail correspondence, letters, review of draft documents, and providing comments and guidance.
July 6, 2012	The Service received the biological assessment and request for formal consultation for the CHST-FB Project from the FRA.
July, 17, 2012	The Service participated in a meeting with URS/HMM/Arup Joint Venture (URS) biologists at the Sacramento Fish and Wildlife Office.
July 19, 2012	The Service requested review of a draft project description proposed for inclusion in the biological opinion for the CHST-FB Project and requested for further information via electronic mail.
September 26, 2012	The Service requested information and submitted an *Information Checklist* template to the FRA and the Authority and URS via electronic mail.
September 27, 2012	The Service received information requested on September 26, 2012 and a completed *Information Checklist* for the CHST-FB Project from the FRA and the Authority and URS via electronic mail.
September 28, 2012	The Service requested the current Draft Compensatory Mitigation Plan and GIS files for the CHST-FB Project via electronic mail.
October 1, 2012	The Service received the Draft Compensatory Mitigation Plan and prospectuses for proposed properties for the CHST-FB Project via electronic mail.
October 16, 2012	The Service requested review and consideration of consistency for conservation measures that will be implemented for species that occur among multiple sections of the California High-Speed Train Project via electronic mail.
November 8 to 9, 2012	The Service participated in a site visit with the FRA and the Authority, California Department of Fish and Wildlife (CDFW), and URS.
November 14, 2012	The Service requested supplemental information, including a review of the project description submitted to the FRA and the Authority and URS on July 19, 2012 via electronic mail.

December 3, 2012	The Service notified the FRA and the Authority, CDFW, and URS via electronic mail that Kern mallow may be present in Tulare County based on new information, and requested revised estimates of habitat loss for plant species that will be affected by the CHST-FB Project.
December 10, 2012	The Service received updated prospectuses for proposed properties for the CHST-FB Project via electronic mail.
December 14, 2012	The Service attended a meeting with the FRA and the Authority, CDFW, URS, AECOM, and Dr. Brian Cypher, to discuss planning for a report to be drafted by Dr. Brian Cypher regarding the status of San Joaquin kit fox throughout its range.
January 3, 2013	The Service provided a summary of pending information action items necessary for completing the biological opinion to the FRA and the Authority via electronic mail.
January 15, 2013	The Service received supplemental information regarding botanical resources from the FRA and the Authority via electronic mail.
January 17, 2013	The Service received an electronic mail memo drafted by Dr. Brian Cypher to the Authority regarding his review of proposed locations of dedicated wildlife crossings for the San Joaquin kit fox, and a revised project description from the FRA and the Authority via electronic mail.
January 28, 2013	The Service participated in a meeting with the FRA and the Authority at the Sacramento Field Office.
January 29, 2013	The Service received the requested GIS files from URS, and submitted revisions and comments to FRA and the Authority regarding the proposed conservation measures via electronic mail.
January 30, 2013	The FRA and the Authority submitted the 2010 memos from Dr. Brian Cypher to the Service via electronic mail.
February 5, 2013	The Service participated in a meeting with the FRA and the Authority at their office to discuss revisions to proposed conservation measures.
February 8, 2013	The Service received revised conservation measures from the FRA and the Authority via electronic mail.

February 11, 2013	The Service received the Assessment of the Use of Agricultural Lands by San Joaquin kit foxes memo, dated February 7, 2013, from Dr. Brian Cypher to the FRA and the Authority via electronic mail.
February 13, 2013	The Service received the *Assessment of Adequacy of Proposed Crossing Structures for San Joaquin Kit Foxes in the Biological Assessment for the Fresno-Bakersfield Segment of the California High-Speed Train* memo, dated February 9, 2013, from Dr. Brian Cypher to the FRA and the Authority via electronic mail. The Service corresponded with Authority and URS regarding estimates of the project action area via electronic mail.
February 15, 2013	The Service received requested information regarding plant surveys conducted in 2010 from the FRA and the Authority via electronic mail. The Service requested further information regarding wildlife crossing opportunities for the San Joaquin kit fox from Dr. Brian Cypher
February 15, 2013 to February, 20, 2013	The Service participated in email correspondence regarding wildlife crossings with Dr. Brian Cypher and the FRA and the Authority.
February 22, 2013	The Service received proposed revisions to the conservation measures from the FRA and the Authority via electronic mail.
February 25, 2013	The Service received additional proposed revisions to the conservation measures from the Authority via electronic mail.
September 18, 2013	The Service received a request from the FRA and Authority for administrative edits to the 2013 FB-BO.
October 8, 2013	The Service received the supplemental biological assessment and request for reinitiation of formal consultation for the CHST-FB Project from the FRA and the Authority.
October 30, 2013	The service participated in a meeting with the FRA and the Authority and URS to discuss the proposed administrative edits and request for reinitiation of formal consultation.
December 4, 2013	The Service participated in a conference call with the FRA and the Authority and URS to discuss the proposed administrative edits and request for reinitiation of formal consultation.

December 18, 2013	The Service participated in a meeting with the FRA and the Authority and URS to discuss the proposed administrative edits and request for reinitiation of formal consultation.
January 6, 2014	The Service participated in a conference call with the FRA and the Authority and URS to discuss the proposed administrative edits and request for reinitiation of formal consultation.
January 28, 2014	The Service participated in a conference call with the FRA and the Authority and URS to discuss the proposed administrative edits and request for reinitiation of formal consultation.
January 30, 2014	The Service received requested GIS files from the Authority and URS.
February 3, 2014	The Service received supplemental information requested during conference calls from the Authority and URS.
July 2012 to March 2014	The Service participated in weekly conference calls with the FRA and the Authority, CDFW, and URS.

PROJECT DESCRIPTION

Description of the Proposed Action

The proposed project includes the construction, operation, and maintenance of an approximately 117-mile long rail line to support an intercity High-Speed Train (HST) from Fresno to Bakersfield in the Central Valley of California. The Fresno to Bakersfield section is one of nine sections of the overall HST system. The HST system will be a state-of-the-art electrically powered, high-speed, steel-wheel-on-steel-rail system. Trains will be capable of operating at speeds of up to 220 miles per hour on a fully grade-separated, dedicated track alignment. The entire rail alignment will be fenced or walled in order to control access for safety and security.

Several potential alignments have been identified in the Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (Fresno Bakersfield RDEIR/SDEIS) for the proposed project. These alternatives include varying siting for not only rail alignments, but also other project infrastructure, including passenger stations, power delivery structures, maintenance-of-way facilities, operations control centers, and a Heavy Maintenance Facility (HMF). Since an alternative has not been selected to date, this biological opinion includes a project description and effects analysis for all alternative alignments, and assesses effects to federally-listed species based on a range of impacts from minimum to maximum (expressed in acreages). Regardless of the final alignment selected, project impacts will be similar geographically as well as in general nature and magnitude.

The project footprint extends to the physical limits of the construction activities associated with the proposed action. The project footprint includes all areas that will be permanently or temporarily affected by the proposed action. The footprint consists of the limits of cut and fill plus all access roads and areas required for operating, storing, and refueling construction equipment.

Parcels within the project footprint that the Authority was granted permission to enter were initially surveyed by biologists in 2010, with follow up surveys in 2011 and 2012. The purpose of the surveys was to determine which habitat types were present and identify potential project effects to federally-listed species. In accordance with the *Central Valley Biological Resource and Wetland Survey Plan* (FRA and Authority 2009 and 2011) physical botanical and wildlife habitat assessment surveys and jurisdictional wetland delineation were conducted within the project footprint. The surveys were done 60 to 120 feet in width depending on if tracks in the area are to be at-grade or elevated and within a 250-foot buffer around the project footprint. To evaluate project effects to wide ranging wildlife and wildlife movement corridors, aerial photographic interpretation and windshield surveys were conducted within a 1000-foot buffer around the project footprint.

In accordance with Service or California Department of Fish and Wildlife species-specific protocols, the study area was extended laterally from the project footprint up to 1.24 miles. Depending on target species, the extended study area identifies species-specific habitats based on aerial photographic interpretation, documented occurrences of the species, and field observations of federally listed species and their habitats.

Approximately 38 percent of the proposed project alignment has been surveyed to date. In areas that were not accessible, biologists conducted, to the extent possible, visual surveys of habitat types. Within unsurveyed areas, aerial photography was used to assess habitat types which were used to calculate the anticipated range of effects to federally-listed species habitat. The entire project alignment will be surveyed prior to construction to determine the effects of the project on federally-listed species, as described in further detail in the Conservation Measures section of this biological opinion.

Although it was difficult to determine the total number of elderberry shrubs (*Sambucus* spp.) that may be affected by the proposed action, the FRA and the Authority estimated that no more than three times the number of shrubs detected in areas surveyed in 2010 (12 shrubs) will likely be encountered within the project action area.

The proposed project is described as the Burlington Northern Santa Fe Railway (BNSF) Alternative Alignment, and consists of a single alignment for the entire length of the rail line, with 10 smaller alternative alignments. These alternatives include two west of Hanford alternatives, each with two variations, at-grade and below-grade; one alternative alignment within the city of Corcoran; three separate alternative alignments around the cities Corcoran, Allensworth, and Wasco; and three alternatives within urban Bakersfield.

The FRA and the Authority may begin construction activities at any point along the initial operating segment-first construction (IOS-first construction) of the statewide HST alignment. The IOS-first construction is approximately 130 miles long and mostly overlaps with the Fresno to Bakersfield section. A 25-mile portion of the IOS-first construction is in the Merced to Fresno Section. Currently, the IOS-first construction is divided into four separate construction packages. Ground disturbance may occur concurrently within any of the construction packages and in more than one location at a time. A description of general project components, project alignment, and construction methods are included below. Additional project details are located in the biological assessment.

General Project Elements

Trainsets

The HST system will be designed to accommodate a typical train 9 to 11 feet in width with a total length of 660 feet and consisting of eight cars. A typical train consisting of two trainsets will seat up to 1,000 passengers and be approximately 1,320 feet long. Trains will operate up to 220 miles per hour.

Rail Line

The proposed project will consist of a fully dedicated rail line, constructed from continuous welded steel rail. The rail line will be in a double-track formation, with one track in each direction. In some areas, such as near regional passenger stations, at least four tracks will be constructed to allow trains to pass one another. The following four general rail line profiles will be constructed: 1) At-grade tracks will be constructed at existing ground levels; 2) elevated tracks will be placed on retained fill; 3) aerial tracks will be placed on bridge structures; and 4) below-grade tracks will be constructed within retained cuts. The general rail profiles are discussed in further detail below.

1. At-grade rail line will be fixed to concrete cross ties that will be bedded in either crushed rock or a concrete slab. The top of the rail will be constructed at a minimum 4.5 feet above the 100-year floodplain. The height of the at-grade profile will vary based on topography and necessary clearance for culverts and other water conveyance structures. Drainage will be accomplished by constructing a 3-foot-wide drainage swale on either side of the rail line, which will be intercepted at regular intervals by culverts. Additional paired 30-inch-wide culverts will be used to prevent ponding along the alignment. Ducts will be constructed alongside the tracks to convey low voltage power cables and fiber optic lines to power trackside signaling and serve communications systems. Duct covers will serve as safety walkways for detraining passengers in the case of emergencies. An 8-foot high security fence will be installed on the outer edge of the HST right-of-way. The overall width of the right-of-way will be approximately 120 feet where the rail line is at grade. The proposed project will include between 79 and 91 miles of at-grade rail line.

2. Rail line elevated on retained fill will be used when necessary to narrow the right-of-way within a constrained corridor. Retaining walls will be built above existing ground level and backfilled.

3. Aerial tracks will be used in urban areas where extensive road networks need to be maintained. Aerial tracks will have a minimum clearance of approximately 16.5 feet over roadways and 24 feet over railroads. Pier supports will be approximately 10 feet in diameter at ground level. This type of rail line may also be used to cross riparian areas and other water features. The proposed project will include 22-33 miles of elevated and aerial rail line combined.

4. Below-grade tracks will be used when the rail alignment crosses under existing rail tracks, roads, or highways that are at-grade. This rail type will be used only for short distances in highly constrained situations. Retaining walls will typically be needed to protect adjacent properties. Below-grade crossings will also be used for roadways when it is preferable for them to go below the rail track. The proposed project will include up to 3 miles of below-grade tracks.

Road Crossings

To maintain local traffic and agricultural access while maintaining grade separation with the HST tracks, the proposed project will include between 172 and 197 road crossings, depending on the selected alignment. Most road crossings will be constructed as overpasses, and each structure will have a footprint ranging 0.62 acre to 137.42 acres, with a median of approximately 24.5 acres.

Wildlife Crossings

To maintain permeability and connectivity for wildlife along the rail line where it is at-grade, a variety of wildlife crossings will be constructed. Wildlife crossings will typically consist of modified culverts, and will be approximately 73 feet long, 10 feet wide, and 3 feet high. To accommodate variations in topography, the height of the at-grade profile may require wildlife crossing structures be depressed up to 1.5 feet below-grade. These crossings will yield a calculated "openness factor" (OF) (Bremner-Harrison et al. 2007) of 0.41, which is a calculation of the function of height, width, and crossing distance. At locations where storm water swales parallel the embankment, or localized flooding may occur, the approach to wildlife crossing structures will be designed to avoid ponding within the structures.

Additional wildlife crossing structure designs may include circular or elliptical pipe culverts, and longer culverts with crossing distances of up to 100 feet. These culverts will be at least 3 feet high, depressed no more than 1.5 feet below-grade, and meet or exceed a minimum 0.41 openness factor.

Additional wildlife crossing opportunities will be available along elevated portions of the alignment, at bridges over riparian corridors, road crossings, and drainage structures (i.e. large

culverts). Dedicated wildlife crossings will be located approximately every 0.3 miles along the rail line between Cross Creek in Kings County and Poso Creek in Kern County. This section of the alignment is located adjacent to the Allensworth Ecological Reserve and the Pixley National Wildlife Refuge which are important areas for wildlife dispersal, particularly the San Joaquin kit fox. Dedicated wildlife crossings will be located on both the north and south sides of major river and creek crossings. There will be between 73 and 98 dedicated wildlife crossings constructed, depending on which rail alignment alternatives are selected. A detailed description of wildlife crossing structures and their proposed locations are included in the biological assessment.

Stations

Stations will be sited and designed to allow for connection to local transit, airports, and highways. All stations will include the following elements:

1. Station buildings of 40,000 to 100,000 square feet that are two to three stories high and contain passenger boarding platforms, ticketing, waiting areas, passenger amenities, employee areas, and baggage and freight areas.

2. Parking facilities from 1.5 to 9 acres in Fresno and Bakersfield and 3.5 to 17.25 acres at the potential Kings/Tulare Regional Station.

3. Waiting areas and queuing space for taxis and buses.

4. Pedestrian connections.

The proposed project will include the construction of up to three train stations, one each in Fresno and Bakersfield, and a potential third Kings/Tulare Regional Station (Regional station) located either east or west of Hanford. One location is being considered for the Fresno station, three potential locations for the Regional station, and three locations are being considered for the Bakersfield station. Station locations will be based according to which rail alignments are selected. The stations will range in size from 18.5 to 20.5 acres for the Fresno Station, 25 to 48 acres for the Regional Station, and 19 to 24 acres for the Bakersfield station. Details of each Station alternative are discussed below.

Fresno Station

The location for the Fresno station is:

1. The Fresno Station-Mariposa Alternative: This station will be located in downtown Fresno, less than 0.5 mile east of State Route (SR) 99 along the BNSF Alternative. This station will be centered on Mariposa Street and bordered by Fresno Street to the north, Tulare Street on the south, H Street on the east, and G Street on the west, and occupy approximately 20.5 acres.

Kings/Tulare Regional Station

The three potential locations for the Regional station include:

1. The Regional Station-East Alternative: This station will be located east of SR 43 and north of the San Joaquin Valley Railroad on the BNSF Alternative, and occupy approximately 27 acres.

2. The Regional Station-West Alternative: This station will be located east of 13th Avenue and north of the San Joaquin Valley Railroad on the Hanford West Bypass 1 and 2 Alternatives, and occupy approximately 48 acres.

3. The Regional Station-West Alternative Below-Grade: This station will be in the same location and similar to the Regional Station West Alternative, except that the platform will be located below-grade. This proposed station will occupy approximately 48 acres.

Bakersfield Station

The three potential locations for the Bakersfield station include:

1. The Bakersfield Station-North Alternative: This station will be located in downtown Bakersfield, at the corner of Truxtun Avenue and Union Avenue, east of an existing Amtrak station and corresponds with the BNSF Alternative Alignment, and occupy approximately 19 acres.

2. The Bakersfield Station-South Alternative: This station will be situated in the same general area as the Bakersfield-North Alternative, but will be located south of the BNSF right-of-way. This station will occupy approximately 20 acres.

3. The Bakersfield Station-Hybrid Alternative: This station will be located in the same general area as the Bakersfield-North and Bakersfield-South Alternatives, at the corner of Truxtun Avenue and Union Avenue, and occupy approximately 24 acres.

Electrical System

The components of the electrical system include the following:

The overhead contact system (OCS), which is the wiring above the track that electrifies the train. OCS poles will be spaced approximately every 200 feet along straight portions of rail and every 70 feet in tight-turn areas.

1. Traction power substations, which provide power to the OCS, will be located approximately every 30 miles and will occupy 0.73 acres each within a 2-acre parcel. Five substations are planned. Each station will include a 20 foot-wide access road from the nearest street access, and a protective perimeter fence will be installed.

2. Switching stations will be located approximately every 15 miles between traction power substations, and will occupy 0.22 acre each. Five switching stations are planned. Switching stations allow adjacent power sections to maintain power in the event of an outage.

3. Paralleling stations will be located approximately every five miles between the traction power substations and switching stations, and serve to stabilize current flow. Seventeen stations are planned and each will occupy 0.18 acre.

Additional elements of the electrical system will include backup and emergency power sources, which will consist of generators or batteries located at passenger stations. Also, signaling and train control huts will be located within the rail line right-of-way.

Heavy Maintenance Facility

One HMF will be constructed between the cities of Merced and Bakersfield in order to support the start-up and maintenance of the trainsets and overall system operation. The HMF will occupy at least 154 acres, and it is not known at this time if it will be located within the footprint of the proposed project or within the Merced to Fresno HST section. Five potential HMF sites are being considered within the Fresno Bakersfield section. The HMF will operate 24 hours a day, 7 days a week, with up to 1,500 employees working at a given time. An Operations Control Center will be co-located with the HMF.

Maintenance-of-Way Facility

A Maintenance-of-Way (MOW) facility will be constructed within the footprint of the proposed project. The MOW will be used for housing equipment and vehicles necessary for accessing the rail alignment and right-of-way for repairs and upgrades. If the HMF is constructed as part of the proposed project, the MOW will be co-located adjacent to the HMF. If the HMF is not constructed in the proposed project, the MOW will be located within the project footprint. The MOW will occupy approximately 26 acres.

Project Alignment

The BNSF Alternative Alignment will extend from Fresno to Bakersfield and will be sited adjacent to the existing BNSF right-of-way to the extent feasible. Several minor deviations from the existing BNSF right-of-way are necessary to accommodate engineering constraints for high-speed trains. The BNSF Alternative Alignment will not follow the BNSF right-of-way within the city of Fresno; rather, the BNSF Alternative will run east of and adjacent to the Union Pacific Railroad (UPRR) right-of-way. The alignment will also veer from the BNSF right-of-way near the cities of Laton and Hanford, and rejoin the BNSF right-of-way near the city of Corcoran. The alignment will generally follow the BNSF corridor through Bakersfield to the project terminus at Oswell Street.

Fresno County

The BNSF Alternative Alignment will begin at the north end of the Fresno station tracks adjacent to the western side of the UPRR right-of-way in the vicinity of Amador Street. The alignment will be below grade for approximately 140 yards as it crosses the Fresno Bee railroad spur. The alignment will return to grade and continue southeast through Fresno on the western side of the UPRR until reaching East Jensen Avenue. A temporary rerouting of existing railroad tracks (known as a shoofly track in railroad parlance) will be required between Fresno Street and SR 41. The temporary track from the shoofly will be removed after the new track is installed and service is restored to the existing track. An intrusion protection barrier approximately 1 mile in length will be required within the project footprint from approximately Stanislaus Street to Ventura Avenue due to the proximity of the UPRR and HST rights-of-way. An intrusion barrier is a safety wall erected between two rail lines to prevent a derailed train from entering the adjacent rail line. The alignment will again be below grade in a shallow trench as it travels underneath East Jensen Avenue, then curve to the south and be elevated over Golden State Boulevard and SR 99. The elevated structure will span just over 1 mile and will reach a maximum height of approximately 55 feet. The alignment will return to grade and join the BNSF corridor on its western side at East Malaga Avenue south of Fresno. The BNSF Alternative will continue through Fresno County along the BNSF right-of-way in an area composed mostly of agricultural land.

Approximately 24 miles of track will be located in Fresno County. Nearly all of the alignment, roughly 22 of the 24 miles, will be at-grade. The HST alignment will be elevated where it crosses from the western side to the eastern side of the BNSF tracks near East Conejo Avenue. The elevated structure will span approximately 1 mile and will reach a maximum height of approximately 42 feet as it crosses over the BNSF tracks. A total of approximately 5.5 miles of BNSF tracks will be realigned from approximately East Sumner Avenue to East Huntsman Avenue and approximately East Rose Avenue to East Kamm Avenue to accommodate the HST alignment. Another 0.5 miles of BNSF tracks will be realigned in the vicinity of South Peach Avenue. The alignment will be at-grade with bridges where it crosses Cole Slough and the Kings River into Kings County. These bridges will clear the Cole Slough and Kings River levees by approximately 3 feet. Dedicated wildlife crossing structures will be placed between 100 and 500 feet to the north and south of Cole Slough and the Kings River. There will be approximately 2 to 4 wildlife crossing structures in Fresno County, depending on the rail alignment alternative selected.

Kings County

Approximately 28 miles of the BNSF Alternative will be in Kings County. The rail line will pass east of the city of Hanford, parallel to and approximately 0.5 mile east of SR 43 (Avenue 8). South of Hanford in the vicinity of Idaho Avenue, the BNSF Alternative will curve to the west and then south toward the BNSF right-of way. The alignment was refined in this area to minimize impacts to aquatic features located north of Corcoran and east of the BNSF tracks. The alignment will rejoin the BNSF right-of-way on its eastern side just north of Corcoran and travel through the eastern edge of the city of Corcoran. The majority of this part of the alignment will

pass through agricultural land except where it travels through the city of Corcoran. The alignment in Corcoran encompasses a number of land uses, including residential, commercial, and industrial. A total of approximately 8 miles of track within Kings County will be elevated. The first elevated portion will be located just east of the city of Hanford, and will span a length of 2.5 miles, beginning just south of Fargo Avenue and ending just north of Hanford Armona Road. This portion of the alignment will pass over the San Joaquin Valley Railroad and SR 198. The structure will reach a height of approximately 50 feet aboveground. The potential Kings/Tulare Regional Station will be located along this structure near the SR 43 and SR 198 interchange.

The alignment will continue at-grade south of Hanford Armona Road for approximately 10 miles, and then ascend onto an elevated structure over Cross Creek and the BNSF right-of-way. The structure will span a length of approximately 2.5 miles, beginning north of Cross Creek and returning to grade north of Nevada Avenue. The elevated structure will reach a maximum height above ground of 40 feet. The alignment will then continue at-grade and require an intrusion protection barrier within the project footprint from approximately Nevada Avenue to approximately North Avenue. The barrier will be approximately 2 miles in length. At Patterson Avenue, the alignment will again ascend onto an elevated structure over Brokaw Avenue, Whitley Avenue, a BNSF Railway spur, and agricultural facilities at the southern end of the city of Corcoran. The elevated structure will span approximately 1.7 miles. The alignment will be constructed on a retained embankment as it crosses into Tulare County, from north of 4th Avenue to Avenue 136. Approximately 0.3 miles of BNSF tracks will be realigned at Oregon Avenue, south of Corcoran.

Dedicated wildlife crossing structures will be provided from approximately Cross Creek south to the Tulare County line in at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative will also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of each of the following river/creek crossings: Dutch John Cut (Slough), Kings River, and Cross Creek. There will be approximately 10 to 18 wildlife crossing structures in Kings County, depending on the rail alignment alternative selected.

Kings County: Proposed HST Alignment over State Route 43

The portion of the HST System alignment that is shifting across SR 43 passes through the Cross Creek grassland region on an at-grade alignment. At-grade portions of the track bed will be built on compacted dirt embankments. The top of the rail will be constructed at a minimum of 4.5 feet above the 100-year floodplain or higher when transitioning to an elevated structure. The height of the at-grade profile may vary to accommodate slight changes in topography, provide clearance for storm water culverts and structures in order to allow water flow, and potential wildlife movement. A drainage system may be designed to include a 3-foot-wide drainage swale located on either side of the rail line, intercepted at regular intervals by culverts and open-structures to carry runoff to existing natural drainage or appropriate municipal drainage systems. Drainage may also include paired 30-inch-wide culverts under the embankment, spaced as frequently as necessary to prevent ponding and allow drainage in the Cross Creek grassland region north of

Corcoran (Figure 1, below), the HST tracks were previously proposed to be located between the existing BNSF Railway tracks and the California Department of Transportation (Caltrans) SR 43 right-of-way. The Caltrans right-of-way in this area varies from 142 feet to 192 feet wide and is intended to allow Caltrans to widen SR 43 to 4 lanes in the future. The FRA and Authority have decided to relocate the HST tracks to the east of the existing Caltrans SR 43 right-of-way. This alignment will require a strip of land east of the existing SR 43 roadway near Cross Creek with a maximum width of 205-feet to construct the HST System and to relocate an existing berm into lacustrine habitat (Figure 2, below: illustration showing the shift in the alignment from the west of SR 43 to the east).

An existing berm that is approximately 12 feet high and 36 feet wide is located adjacent to the SR 43 right-of-way; this berm will be shifted and reconstructed to the east of the HST System. The relocated berm will function and perform similarly as the existing berm by continuing to store agricultural water from excess water releases. Similar to the existing structure, the relocated berm will be a barrier to hydrological connectivity outside of the lacustrine habitat. Reconstruction of the existing berm will include reusing suitable material from the existing berm, supplemented by borrow material as necessary. Typical construction equipment such as front-end loaders, scrapers, and dump trucks, will be used to reconstruct a berm with similar geometry and structural functions as the existing berm, to the east of its current location. All work will be conducted in accordance with relevant general and species-specific conservation measures.

Potentially suitable aquatic habitat within the range of the central California tiger salamander in the SR 43/Cross Creek area consists of man-made ponds mapped as lacustrine habitat. This lacustrine habitat is used for agricultural water storage and is filled with excess water releases pumped in from Cross Creek. The fill and drainage of this feature is done when water is available or when water is needed for irrigation purposes. Due to the artificial and managed hydrology of this area, this site's lacustrine habitat likely provides limited, low-quality breeding habitat, if any, for the central California tiger salamander.

Construction work window restrictions for wetlands and other waters of the U.S. will be implemented to reduce direct and indirect effects of construction activities on federally listed species within those habitats. In the event that construction work window restrictions cannot be conducted, dewatering, water diversions, or additional best management parties (BMPs) will be employed as determined through agency consultation.

Tulare County

The BNSF Alternative will cross approximately 22 miles of Tulare County. The alignment will travel through the county adjacent to the western side of the BNSF right-of-way. The majority of the alignment will be at-grade, with only a combined total of 4 miles elevated where the

Figure 1. Fresno to Bakersfield project footprint.

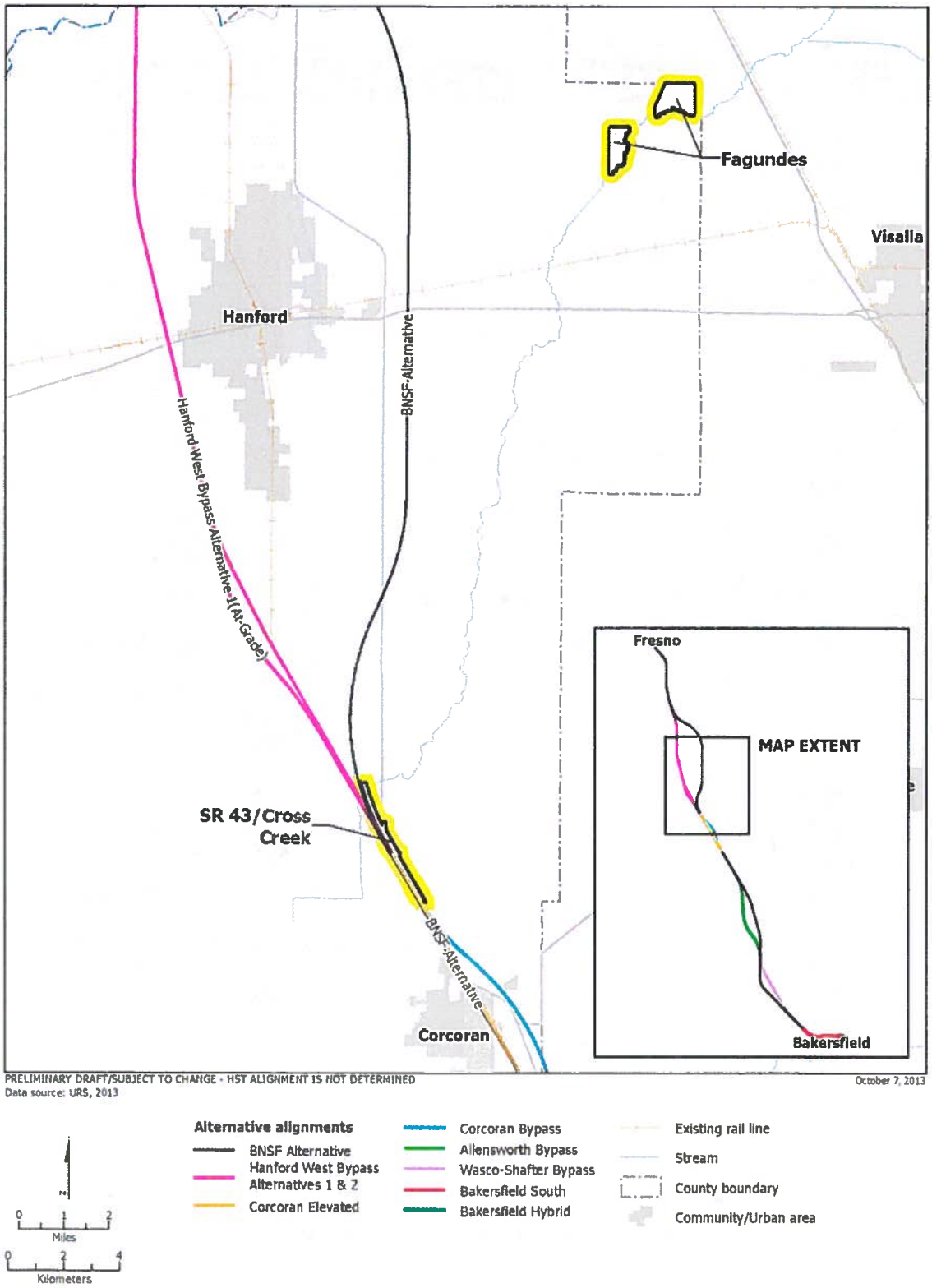
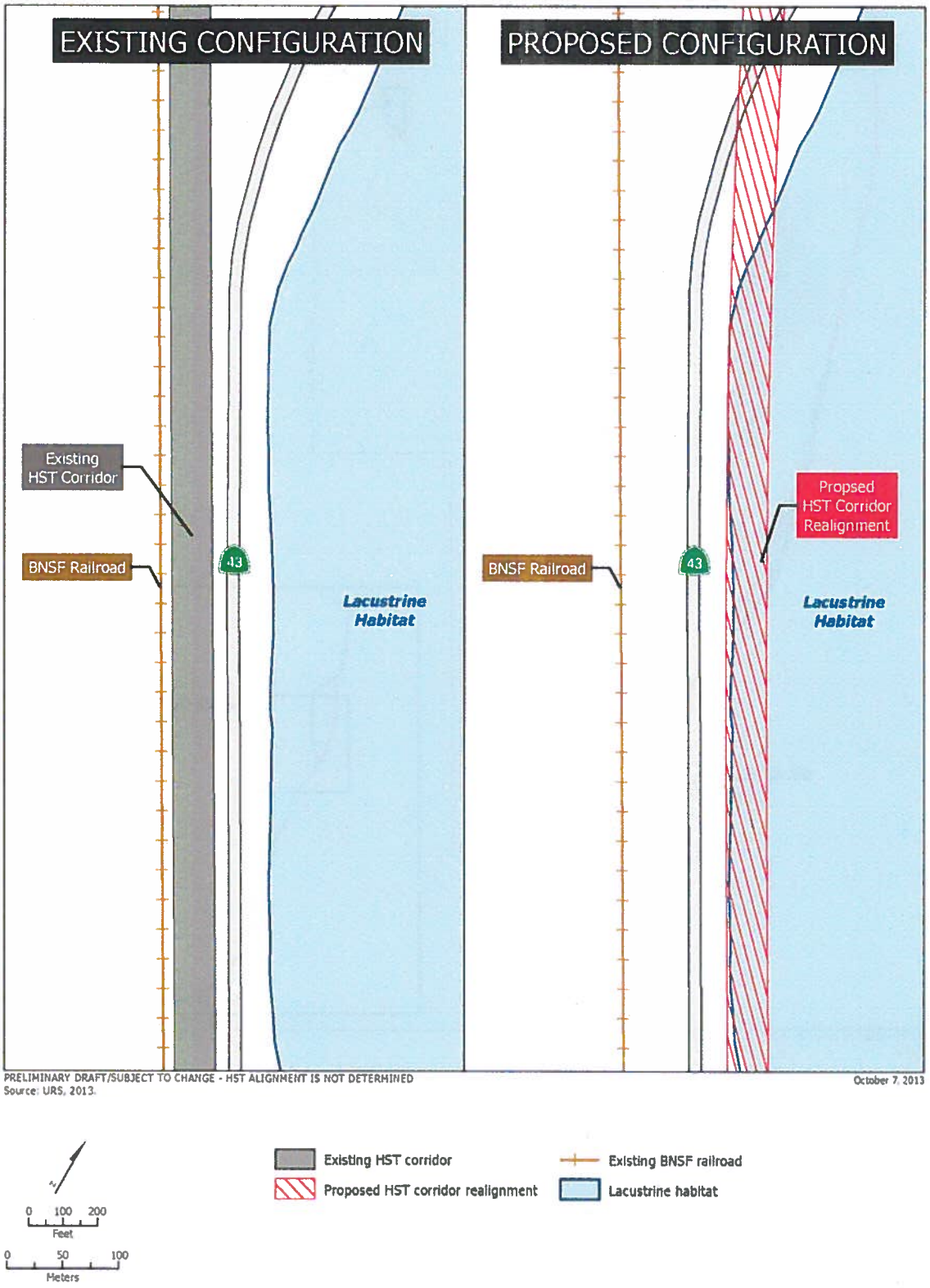


Figure 2. CHST-FB corridor realignment: Shift in the alignment from the west of SR 43 to the east.



alignment crosses the Tule River, and then both Deer Creek and the Stoil railroad spur from the BNSF Railway. The elevated structure will reach a height of approximately 50 feet. This alignment will cross over Lakeland Canal.

Dedicated wildlife crossing structures will be provided throughout at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative will also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of each of the following river/creek crossings: Tule River and Deer Creek. There will be approximately 68 to 72 wildlife crossing structures in Tulare County, depending on the rail alignment alternative selected.

Kern County

The Kern County portion of the BNSF Alternative is approximately 44 miles long and will pass through the cities of Wasco and Shafter on its way to Bakersfield. The alignment will closely follow the western side of the BNSF corridor until just south of Wasco, where it will cross over to the eastern side of the BNSF tracks. Approximately 4 miles of BNSF tracks will be realigned in the vicinity of 4th Street, from 8th Street to Poso Avenue, and from Jackson Avenue to Merced Avenue to accommodate the HST alignment. The alignment will continue on the eastern side of the BNSF right-of-way through Shafter and then cross over once more to the western side of the BNSF right-of-way. Approximately 8 miles of Santa Fe Way will be shifted west of the proposed alignment to accommodate the HST right-of-way, from north of Riverside Street to south of Renfro Road. Approximately 1.5 miles of the BNSF's Lone Star Rail Spur will be realigned from Riverside Street to south of Burbank Street. The alignment will generally follow the BNSF corridor through Bakersfield to the project terminus at Oswell Street. Approximately 2.5 miles of BNSF tracks will be realigned in Bakersfield from Jomani Drive to Glenn Street and from Oak Street to C Street to accommodate the alignment. Within this portion of the alignment, approximately 27 miles will be at-grade, and the remainder of the alignment will be elevated. Specifically, three elevated sections will occur along this section of the BNSF Alternative in the cities of Wasco, Shafter, and Bakersfield. The alignment will be at-grade with a bridge where it crosses Poso Creek.

The first elevated structure will begin at 1st Street, pass through Wasco for about 3 miles and return to grade north of Kimberlina Road. This structure will reach a height of approximately 45 feet to the top of the rail. From approximately Kimberlina Road, the alignment will continue at-grade for approximately 5 miles to just north of Shafter Avenue where it will again ascend onto an elevated structure.

The second elevated structure will run through Shafter for a distance of about 3.5 miles, between Shafter Avenue and Cherry Avenue. This structure will pass over a BNSF Railway yard within the city, and reach a maximum height of approximately 45 feet to the top of the rail. After returning to grade just south of Cherry Avenue, the alignment will travel approximately 10 miles to Country Breeze Place where it will ascend onto another elevated structure through Bakersfield.

The third elevated structure will run from Country Breeze Place through the Bakersfield Station to the terminus of the BNSF Alternative at Oswell Street. The elevated structure through Bakersfield will pass over the transportation corridor improvement projects, SR 99, the Kern River, and a BNSF Railway yard. The structure will range in height from 50 to 90 feet to the top of the rail. The highest elevations in the city of Bakersfield will be reached between Rosedale Highway and SR 99. From SR 99 to the terminus of the BNSF Alternative, the structure will range in height from 50 to 70 feet to the top of the rail.

Dedicated wildlife crossing structures will be provided in at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative will also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of the Poso Creek crossing. There will be approximately 12 to 16 wildlife crossing structures in Kern County, depending on the rail alignment alternative selected. Dedicated wildlife crossing structures will not be installed between 100 and 500 feet to the north and south of the Kern River, because the BNSF Alternative will be elevated.

Alternative Alignments and Bypasses

In addition to the BNSF Alternative, the FRA and the Authority are considering seven other alternative alignments for portions of the Fresno to Bakersfield Section. The FRA and the Authority developed these alternatives to avoid environmental, land use, or community impacts identified for portions of the BNSF Alternative.

Hanford West Bypass 1 Alternative

The Hanford West Bypass 1 Alternative Alignment will parallel the BNSF Alternative from East Kamm Avenue to approximately East Elkhorn Avenue in Fresno County. At East Conejo Avenue where the BNSF Alternative crosses to the eastern side of the BNSF tracks to pass the city of Hanford to the east, the Hanford West Bypass 1 Alternative continues south on the western side of the BNSF tracks. The Hanford West Bypass 1 will diverge from the BNSF corridor just south of East Elkhorn Avenue and ascend onto an elevated structure just south of East Harlan Avenue, cross over the Kings River complex and Murphy Slough, and passing the community of Laton to the west. The elevated structure will be approximately 0.8 miles in length and reach a maximum height of approximately 40 feet to the top of the rail. The Hanford West Bypass 1 Alternative will return to grade just north of Dover Avenue. The alignment will continue at-grade, curve gently to the east, and travel between the community of Armona to the west and the city of Hanford to the east. The Hanford West Bypass 1 Alternative rejoins the BNSF corridor on its western side at about Lansing Avenue. The alignment will then ascend onto another elevated structure, and travel over Cross Creek and the special aquatic features that exist north of the city of Corcoran. The elevated structure will span approximately 3 miles and reach a maximum height of approximately 20 feet to the top of the rail. This alignment will return to grade just north of Nevada Avenue and will connect to the BNSF Alternative traveling through Corcoran at-grade, on the western side of the BNSF corridor. The total length of the Hanford West Bypass 1 Alternative will be approximately 28 miles.

The Hanford West Bypass 1 Alternative includes a design option where the alignment will be below-grade between Grangeville Boulevard and Houston Avenue. The alignment will travel below-grade in an open cut with side slopes as it transitions to a retained-cut profile, approximately 40 feet below ground level. As the alignment transitions back to grade just north of Houston Avenue, the open cut profile will be used once more. The alignment will cross SR 198 and several local roads. South Peach Avenue, East Clarkson Avenue, East Barrett Avenue, Elder Avenue, and South Tenth Avenue will be closed at the HST right-of-way, while the other roads will be realigned and/or grade-separated from the HST with overcrossings or undercrossings. Grade separations at Grangeville Boulevard, 13th Avenue, and West Lacy Boulevard will be determined based on the alignment design option selected (at-grade or below-grade).

The potential Kings/Tulare Regional Station–West Alternative will be sited along this alignment east of 13th Avenue, between Lacey Boulevard and the San Joaquin Valley Railroad spur. This potential station includes at-grade and below-grade design options as well.

Hanford West Bypass 2 Alternative

The Hanford West Bypass 2 Alternative Alignment will be the same as the Hanford West Bypass 1 Alternative from East Kamm Avenue to just north of Jackson Avenue, but at this point the Hanford West Bypass 2 Alternative will curve away to the east from the Hanford West Bypass 1 alignment. The Hanford West Bypass 2 Alternative will then travel over Kent Avenue, the BNSF right-of-way, and Kansas Avenue on an elevated structure approximately 1.5 miles in length. The structure will reach a maximum height of 55 feet to the top of the rail before returning to grade north of Lansing Avenue and continuing along the BNSF corridor. Similar to the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative will travel over Cross Creek and the special aquatic features north of Corcoran and return to grade north of Nevada Avenue; however, the Hanford West Bypass 2 Alternative will be on the eastern side of the BNSF tracks to connect to either the Corcoran Elevated Alternative or the Corcoran Bypass Alternative. Like the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative will have a total length of approximately 28 miles.

The Hanford West Bypass 2 Alternative includes the same below-grade design option as the Hanford West Bypass 1 Alternative between Grangeville Boulevard and Houston Avenue as well as both at-grade and below-grade options at the potential Kings/Tulare Regional Station–West Alternative. Similar to the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative will cross SR 198 and several local roads. Road closures will be the same as those for the Hanford West Bypass 1 Alternative, and roadway modifications at Grangeville Boulevard, 13th Avenue, and West Lacey Boulevard will depend on the alignment design option selected.

Corcoran Elevated Alternative

The Corcoran Elevated Alternative Alignment will be the same as the corresponding section of the BNSF Alternative from approximately Nevada Avenue south of Hanford to Avenue 136,

except that it will pass through the city of Corcoran on the eastern side of the BNSF right-of-way on an aerial structure. The aerial structure begins at Niles Avenue and returns to grade south of 4th Avenue. It will reach a maximum height of approximately 51 feet to the top of the rail. The total length of the Corcoran Elevated Alternative will be approximately 10 miles. An intrusion protection barrier will be required in the at-grade portion of the alignment from north of Nevada Avenue to just north of Niles Avenue due to the proximity of the BNSF and HST rights-of-way. This barrier will be approximately 2 miles in length. Approximately 0.2 miles of BNSF tracks will be realigned at Patterson Avenue.

Dedicated wildlife crossing structures will be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures will also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings. This alternative alignment will cross SR 43 and pass over several local roads on an elevated aerial structure. Santa Fe Avenue will be closed at the HST right-of-way.

Corcoran Bypass Alternative

The Corcoran Bypass Alternative Alignment will diverge from the BNSF Alternative at Nevada Avenue and swing east of Corcoran, rejoining the BNSF Railway route at Avenue 136. The total length of the Corcoran Bypass will be approximately 10 miles. An intrusion protection barrier will be required in the vicinity of Nevada Avenue due to the proximity of BNSF and HST rights-of-way. Similar to the corresponding section of the BNSF Alternative, the majority of the Corcoran Bypass Alternative will be at-grade. However, one elevated structure will carry the HST over SR 43, the BNSF tracks, and the Tule River. The structure will reach a maximum height of approximately 45 feet to the top of the rail.

Dedicated wildlife crossing structures will be provided from approximately Cross Creek south to Avenue 136 in the at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures will also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment will cross SR 43, Whitley Avenue/SR 137, and several local roads. SR 43, Waukena Avenue, and Whitley Avenue will be grade-separated from the HST with an overcrossing or undercrossing; other roads, including Niles Avenue, Orange Avenue, and Avenue 152, will be closed at the HST right-of-way.

Allensworth Bypass Alternative

The Allensworth Bypass Alternative Alignment will pass west of the BNSF Alternative to avoid the Allensworth ER and the Colonel Allensworth State Historic Park. The total length of the Allensworth Bypass Alternative Alignment will be approximately 21 miles; the alternative will begin at Avenue 84 and rejoin the BNSF Alternative at Elmo Highway. The Allensworth Bypass

Alternative will be constructed on an elevated structure only where the alignment crosses Deer Creek and the Stoil railroad spur. The majority of the alignment will pass through Tulare County at-grade.

Dedicated wildlife crossing structures will be provided from approximately Avenue 84 to Poso Creek at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures will also be placed between 100 and 500 feet to the north and south of both the Deer Creek and the Poso Creek crossings.

The Allensworth Bypass will cross several roads, including County Road J22, Avenue 24, Garces Highway, Woollomes Avenue, Magnolia Avenue, Pond Road, and Elmo Highway. Avenue 24, Woollomes Avenue, and Elmo Highway will be closed at the HST right-of-way, and the other roads will be realigned and/or grade-separated from the HST with overcrossings.

Wasco-Shafter Bypass Alternative

The Wasco-Shafter Bypass Alternative Alignment will diverge from the BNSF Alternative between Taussig Avenue and Zachary Avenue, cross over to the eastern side of the BNSF tracks and bypassing Wasco and Shafter to the east. The Wasco-Shafter Bypass Alternative will be at-grade except where it travels over 7th Standard Road and the BNSF tracks to rejoin the BNSF Alternative. This aerial structure will reach a maximum height of 75 feet to the top of the rail. Approximately 4 miles of Santa Fe Way will be shifted to the west of the proposed alignment from approximately Galpin Street to south of Renfro Road to accommodate the HST right-of-way. The total length of the alternative alignment will be 21 miles.

The Wasco-Shafter Bypass will cross SR 43, SR 46, East Lerdo Highway and several local roads. Some roads, such as SR 46, Kimberlina Road, Shafter Avenue, Beech Avenue, Cherry Avenue, and Kratzmeyer Road will be grade-separated from the HST with overcrossings/undercrossings; other roads will be closed at the HST right-of-way.

Bakersfield South Alternative

From the Rosedale Highway (SR 58) in Bakersfield, the Bakersfield South Alternative alignment parallels the BNSF Alternative at varying distances to the north. At Chester Avenue, the Bakersfield South Alternative curves south and parallels California Avenue. As with the BNSF Alternative, the Bakersfield South Alternative will begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to its terminus at Oswell Street. The elevated section will range in height from 50 to 90 feet to the top of the rail. The realignment of the BNSF tracks from Jomani Drive to Glenn Street in Bakersfield will be required, as it is for the BNSF Alternative. Dedicated wildlife crossing structures will not be installed between 100 and 500 feet to the north and south of the Kern River, because the Bakersfield South Alternative will be elevated.

The Bakersfield South Alternative will be approximately 12 miles and will cross the same roads as the corresponding portion of the BNSF Alternative. This alternative includes the Bakersfield Station–South Alternative.

Bakersfield Hybrid Alternative

From Rosedale Highway (SR 58) in Bakersfield, the Bakersfield Hybrid Alternative follows the Bakersfield South Alternative as it parallels the BNSF Alternative at varying distances to the north. At approximately A Street, the Bakersfield Hybrid Alternative diverges from the Bakersfield South Alternative, crosses over Chester Avenue and the BNSF right-of-way in a southeasterly direction, and then curves back to the northeast to parallel the BNSF tracks toward Kern Junction. After crossing Truxtun Avenue, the alignment curves to the southeast to parallel the UPRR tracks and Edison Highway to its terminus at Oswell Street. As with the BNSF and Bakersfield South alternatives, the Bakersfield Hybrid Alternative will begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to Oswell Street. The elevated section will range in height from 30 to 90 feet to the top of the rail. The realignment of the BNSF tracks from Jomani Drive to Glenn Street in Bakersfield will be required, as it is for both the BNSF and the Bakersfield South alternatives. Dedicated wildlife crossing structures will not be installed between 100 and 500 feet to the north and south of the Kern River, because the Bakersfield Hybrid Alternative will be elevated.

The Bakersfield Hybrid Alternative will be approximately 12 miles long and will cross many of the same roads as the BNSF and Bakersfield South alternatives. This alternative includes the Bakersfield Station–Hybrid Alternative.

Construction Methods

Pre-Construction Activities

During final design, the FRA and the Authority and its contractor will conduct a number of pre-construction activities to determine how best to stage and manage the actual construction. These activities will include the following:

1. Conducting geotechnical investigations which will focus on defining precise geology, groundwater, seismic, and environmental conditions along the alignment. The results of this work will guide final design and construction methods for foundations, underground structures, tunnels, stations, grade crossings, aerial structures, systems, and substations.

2. Identifying staging areas and precasting yards which will be needed for the casting, storage, and preparation of precast concrete segments, temporary spoil storage, workshops, and the temporary storage of delivered construction materials. Field offices and/or temporary jobsite trailers will also be set up at the staging areas.

3. Initiating site preparation and demolition, such as clearing, grubbing, and grading, followed by the mobilization of equipment and materials. Demolition will require strict

controls to ensure that adjacent buildings or infrastructure are not damaged or otherwise affected by the demolition efforts.

Relocating utilities, where the contractor will work with the utility companies to relocate or protect in place such high-risk utilities as overhead tension wires, pressurized transmission mains, oil lines, fiber optics, and communications prior to construction.

4. Implementing temporary, long-term, and permanent road closures to re-route or detour traffic away from construction activities. Handrails, fences, and walkways will be provided for the safety of pedestrians and bicyclists.

5. Siting the temporary batch plants that will be required to produce the Portland cement concrete or asphaltic concrete needed for roads, bridges, elevated structures, retaining walls, and other large structures. These plants generally consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; aboveground storage tanks; and designated areas for sand gravel truck unloading, concrete truck loading, and concrete truck washout. The contractor will be responsible for implementing procedures for reducing air emissions, mitigating noise impacts, and reducing the discharge of potential pollutants into storage drains or watercourses from the use of equipment, materials, and waste products.

6. Conducting other studies and investigations, as needed, such as local business surveys to identify business usage, delivery, shipping patterns, and critical times of the day or year for business activities. This information will help develop construction requirements and worksite traffic control plans, and will identify potential alternative routes, cultural resource investigations, and historic property surveys.

Major Construction Activities

Four major types of construction activities (earthwork; construction of bridges, aerial structures, and road crossings; construction of railroad systems; and construction of stations) are briefly described below.

Earthwork

Earth support is an important factor in constructing the deep excavations that will be encountered on several alignment sections. It is anticipated that the following excavation support systems may be used along the route. The three general excavation support categories are described below.

1. Open Cut Slope: Open cut slope is used in areas where sufficient room is available to open-cut the area and slope the sides back to meet the adjacent existing ground. The slopes are designed similar to any cut slope (i.e., the natural repose angle of adjacent ground material and global stability are taken into account).

2. Temporary: Temporary excavation support structures are designed and installed to support vertical or near vertical excavation faces in areas where room to open-cut does not exist. These structures do not contribute to the final load carrying capacity of the trench structure and they are either abandoned in place or dismantled as the excavation is being backfilled. Generally, a temporary excavation support structure consists of soldier piles and lagging, sheet pile walls, slurry walls, secant piles, or tangent piles.

3. Permanent: Permanent structures are designed and installed to support vertical or near vertical excavation faces in areas where room to open-cut does not exist. These structures form part of the permanent final structure. Generally permanent structures consist of slurry walls, secant piles, or tangent pile walls.

Construction of Bridge, Aerial Structure and Road Crossing

Each bridge or aerial structure will contain two tracks (one in each direction). There will be four tracks (two for local trains that stop at the station and two for express trains that pass through) at the elevated station alternatives in Fresno and Bakersfield (the potential Kings/Tulare Regional Station will at-grade or below grade). Station tracks will be 6,000 feet long with the station at the center. Of the four tracks passing through the station, the two express tracks (for trains that do not stop at the station) will be separated from those that stop at the station and platforms. In constructing the station tracks, more than one dual track aerial structure may be necessary. Similar to existing high-speed rail systems around the world, it is anticipated that the bridges and aerial structures will be designed and built as single box segmental girder. Where needed, other structural types will be considered and used, including steel girders, steel truss, and cable-supported structures. Basic construction elements of bridges, aerial structures, and road crossings are listed below:

1. Foundations: A typical aerial structure foundation pile cap is supported by an average of 4 large diameter bored piles with diameters ranging from 5 to 9 feet. The depth of the piles depends on geotechnical site conditions. Pile construction can be achieved by using rotary drilling rigs, and either bentonite slurry or temporary casings may be used to stabilize pile shaft excavation. The estimated pile production rate is 4 days per pile installation. Additional pile installation methods available to the contractor include bored piles, rotary drilling cast-in-place piles, driven piles, and a combination of pile jetting and driving. On completing the piles, pile caps can be constructed using conventional methods. For pile caps constructed near existing structures (e.g., the railway, bridges, underground drainage culverts), temporary sheet piling can be used to minimize disturbances to adjacent structures. It is anticipated that sheet piling installation and extraction is achieved using hydraulic sheet piling machines.

2. Substructure: Aerial structures with pier heights ranging from 20 to 90 feet may be constructed using conventional jump form and scaffolding methods. A self-climbing formwork system may be used to construct piers and portal beams over 90 feet high. The self-climbing formwork system is equipped with a winched lifting device, which is raised up along the column by hydraulic means with a structural frame mounted on top of the

previous pour. In general, a 3-day cycle for each 12-foot pour height can be achieved. The final size and spacing of the piers depends on the type of superstructure and spans they are supporting.

3. Superstructure: It will be necessary to consider the loadings, stresses, and deflections encountered during the various intermediate construction stages, including changes in static scheme, sequence of tendon installation, maturity of concrete at loading, and load effects from erection equipment. As a result, the final design will depend on the contractor's means and methods of construction and can include several different methods, such as a span-by-span, incrementally launched, progressive cantilever, and balanced cantilever.

Construction of Railroad Systems

The railroad systems are to include trackwork, traction electrification, signaling, and communications. After completion of earthwork and structures, trackwork is the first rail system to be constructed, and it must be in place to start traction electrification and railroad signalizing installation.

Trackwork construction generally requires the welding of transportable lengths of steel running onto longer lengths (approximately 0.25 mile), which are placed in position on crossties or track slabs and field-welded into continuous lengths. Both tie and ballast as well as slab track construction will be used. Tie and ballast construction, which will be used for at-grade and minor structures, typically uses cross ties and ballasts that are distributed along the trackbed by truck or tractor. In sensitive areas, such as where the HST is parallel to or near streams, rivers, or wetlands, and in areas of limited accessibility, this operation may be accomplished by using the established right-of-way with material delivery via the constructed rail line. For major civil structures, slab track construction will be used. Slab track construction is a non-ballasted track form employing precast track supports.

The traction electrification equipment to be installed will include traction power substations and the OCS. Traction power substations are typically fabricated and tested in a factory, then delivered by tractor-trailer to a prepared site adjacent to the alignment. It is assumed that substations are to be sited every 30 miles along the alignment. The OCS will be assembled in place over each track and will include poles, brackets, insulators, conductors, and other hardware.

The signaling equipment to be installed includes wayside cabinets and bungalows, wayside signals (at interlocking), switch machines, insulated joints, impedance bounds, and connecting cables. The equipment will support automatic train protection, automatic train control, and positive train control to control train separation, routing at interlocking, and speed.

Construction of Stations

The typical construction sequence will be:

1. Demolition and Site Preparation: The contractor will be required to construct detour roadways, new station entrances, construction fences and barriers, and other elements required because the existing facilities on the worksite are taken out of service. The contractor will be required to perform street improvement work, site clearing and earthwork, drainage work, and utility relocations. Substations and maintenance facilities are assumed to be newly constructed structures. For platform improvements or additional platform construction, the contractor may be required to realign existing track.

2. Structural Shell and Mechanical/Electrical Rough-Ins: For these activities, the contractor will construct foundations and erect the structural frame for the new station, enclose the new building, and/or construct new platforms and connect the structure to site utilities. The contractor will also rough-in electrical and mechanical systems and install specialty items such as elevators, escalators, and ticketing equipment.

3. Finishes and Tenant Improvements: The contractor will install electrical and mechanical equipment, communications and security equipment, finishes, and signage. The contractor may also install other tenant improvements, if requested.

Construction Materials and Equipment

The materials required for construction will include steel rails, building materials for the maintenance facilities, control buildings, and power supply facilities; concrete; reinforcing steel; ballast; cement; aggregates; specialized train system components; fuel; and water. The materials will be delivered and stored at the project site for use.

Fill material will be excavated from local borrow sites and hauled by truck to the rail alignment. Railroad ballast will be drawn from existing, permitted quarries in various locations, from the Bay Area to Southern California. Ballast will be delivered by a combination of rail and trucks. All materials will be suitable for construction purposes and free from toxic pollutants in toxic amounts in accordance with Section 307 of the Clean Water Act.

Various types of construction equipment will be used in the different phases of the project. The types of equipment associated with the different construction phases are listed in Appendix A of the biological assessment.

Construction Staging

To the extent practical, construction staging will utilize the same areas that will ultimately be occupied by permanent HST facilities. For example, staging areas will be placed at the future locations of the HST maintenance yards in Fresno and Bakersfield. Five additional staging areas will be set up at various points along the HST right-of-way. These staging areas will be spaced roughly evenly between Fresno and Bakersfield, and will be chosen for their easy access to the local road network and highways. All proposed construction staging areas are contained within the limits of the project footprint.

Construction Schedule

Project construction will generally occur in 8-hour shifts between 7 a.m. and 7 p.m., 6 days per week. Occasionally, double shifts may also be required and will be subject to local regulations regarding construction hours. The proposed CHST-FB Project construction schedule is detailed below (Table 1).

Table 1. Proposed construction schedule for the CHST-FB Project.

Phase	Tasks	Duration
Right-of-Way Acquisition	Per Assembly Bill 3034, proceed with right-of-way acquisitions once State Legislature appropriates funds in annual budget	TBD
Survey and Preconstruction	Locate utilities, establish right-of-way and project control points and centerlines, and establish or relocate survey monuments	TBD
Mobilization	Mobilize safety devices and special construction equipment	April 2014–July 2014
Site Preparation	Relocate utilities; clear/grub right-of-way; establish detours and haul routes; prepare construction equipment yards, stockpile materials, and establish precast concrete segment casting yard	July 2014–October 2014
Earth Moving	Prepare excavations and earth support structures	November 2014–November 2016
Construction of Road Crossings	Prepare surface street modifications and grade separations	November 2014–November 2016
Construction of Aerial Structures	Construct aerial structures and bridge foundations, substructures, and superstructures	November 2014–January 2017
Track Laying	Lay tracks, including backfilling operations and drainage facilities	November 2016–August 2017
Systems	Prepare train control systems; paralleling, switching, and traction power systems; overhead contact system; communication system; signaling equipment	June 2017–May 2019
Demobilization	Demobilize, including site cleanup	October 2016–April 2017
HMF Phase 1 [a]	Assemble test track and prepare storage	May 2017–November 2018
Maintenance-of-Way Facility	Potentially co-located with HMF[a]	May 2017–November 2018
HMF Phase 2 [a]	Assemble test track	May 2017–November 2018
HMF Phase 3 [a]	Assemble HMF	June 2018–November 2018
HST Stations	Prepare/conduct demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Fresno: June 2017–April 2020 Kings/Tulare Regional: TBD[b] Bakersfield: June 2018–April 2021

Notes:

[a] HMF would be sited in either the Merced to Fresno Section or the Fresno to Bakersfield Section.

[b] Right-of-way would be acquired for the Kings/Tulare Regional Station once it is decided that it will be constructed; however, the station itself

HMF = heavy maintenance facility

HST = high-speed train

TBD = to be determined

Operations and Maintenance

This section describes the train schedule, lighting, and maintenance and inspection activities.

Train Service

Three categories of trains will be operated: express, limited-stop, and all-stop trains. Express trains will run between major stations (e.g., San Francisco, Los Angeles, San Diego). An express train could make the trip between San Francisco and Los Angeles in 2 hours and 40 minutes.

Limited-stop trains will skip selected stops along the route to provide faster service between stations. All-stop trains will focus on regional service.

Lighting

In general, the right-of-way will not be lighted except at stations and associated maintenance and electrical facilities. Station lighting will be designed to provide safety for arriving and departing passengers within urban areas. Maintenance and electrical facilities will have permanent lighting for both interior and exterior areas, as needed to support operations, including those operations that require lighting 24 hours per day. Typically, exterior lights will be mounted on tall masts, towers, or poles and illuminate the area with sodium- or mercury-vapor light. The lights will be angled toward the ground to limit reflectance on the surrounding community.

Maintenance and Inspection Activities

During operation of the HST system, programmed inspection and maintenance will be performed to verify that the project components are functioning as required. The FRA and the Authority will regularly perform maintenance along the track and railroad right-of-way as well as the power systems, train control, signalizing, communications, and other vital systems required for the safe operation of the HST system. Maintenance for the HST will include the following activities:

1. Inspection and repair of the rail line, the power supply system, structures (including dedicated wildlife crossings), signaling/control components, stations and the maintenance facilities.

2. Drain cleaning, vegetation control, and litter removal along the right-of-way, aerial structures, and bridge sections.

3. Long-term maintenance may include intermittent activities, such as replacing short lengths of rail or ballast. A maintenance-of-way program will be instituted to schedule inspection and maintenance activities.

FCMS: Project Description

The FCMS has been proposed as one of the locations that will be used as part of the Compensatory Mitigation Plan that has been developed to offset impacts to natural habitats that have the potential to support Federally-listed species. The FCMS includes opportunities for vernal pool and seasonal wetland (wetland) preservation; grassland (upland) preservation; vernal pool establishment, rehabilitation, enhancement, and restoration; and riparian rehabilitation and enhancement. Planned activities willconsist of restoration enhancement, establishment, preservation, and long-term management of wetlands and native vegetation communities to approximate the historical landscape based on the existing conditions of onsite vernal pools and those on nearby reference sites.

Land Grading and Contouring

Excavation will occur in up to 10 acres proposed for vernal pool restoration/ enhancement. Grading may also be necessary in the immediate uplands adjacent to restored vernal pools in order to establish appropriate topography. Up to 10 acres of vernal pool depressions will be restored/enhanced throughout the 405-acre site (currently an annual grassland upland habitat) to mimic the existing vernal pools of the FCMS. Restoration/enhancement of vernal pools will result in up to 10 acres of conversion of upland habitat to vernal pool/wetland habitat. Excavation depths will vary for each pool and will be determined by pool size, shape, slope, and position. Pools will be constructed to include outlet features that will limit ponding depth to better mimic the natural pools in the design reference site and to establish hydrological interconnectivity between new pools and the existing vernal pools and seasonal wetlands/drainages (seasonal wetlands) within the FCMS. Excavation to restore vernal pools will thus result in 10 acres of permanent impacts to uplands. Minor grading and contouring will occur in uplands adjacent to restored pools to establish appropriate topography. Assuming a 50 foot buffer is used around each pool, an additional 40 acres of uplands will be graded to establish topography; these impacts will be temporary and the acreage will remain as upland habitat. The restored vernal pools will be seeded through inoculum collected from existing vernal pools and seasonal wetlands and by natural vectors such as hydrologic connectivity, birds, other wildlife species, and cattle.

Minor and temporary ground disturbance will occur in order to collect inoculum (cysts for invertebrates and seeds for native plant taxa) from existing pools proposed for preservation. As described below, inoculum will be collected from 10 percent of the surface area of the donor pools (up to 0.76-acre) to a depth of no more than one inch. Temporary disturbance may also occur within the remaining area of the project site (up to 395 acres) in order to bring vehicles into the site for grading or transport personnel to the project.

The FRA and the Authority also propose to conduct riparian restoration and enhancement along the existing Cross Creek riparian corridor. Restoration of riparian cover will involve planting the appropriate riparian species (based on the species currently growing in the area), irrigating during plant establishment, and installing riparian exclusion fencing or fencing around plantings to protect them from cattle grazing for the first year after planting. Native riparian cover will be

reestablished by obtaining canes from donor trees (e.g., willow, cottonwood, valley oak, other native riparian trees, associated native shrubs) either onsite or within the Cross Creek watershed (maximum of 10 canes per tree), a suitable ancillary collection site, or sourced from local nurseries with native species in containers.

Restoration activities proposed at the FCMS will include the following project elements and site developments (generally in chronological order):

1. Construction schedules and practices (Vernal Pool Establishment and Riparian Rehabilitation/Enhancement Areas).

2. Land grading and contouring (Vernal Pool Establishment Area).

3. Inoculum collection (Wetland Preservation Area).

4. Vernal pool inoculation and erosion control (Vernal Pool Establishment Area).
5. Riparian planting and associated erosion control measures along Cross Creek (Riparian Rehabilitation/Enhancement Area).

6. Long-term management of the FCMS will include monitoring and maintenance consistent with the terms of one or more conservation easements placed on the site and a long-term management plan developed for the site.

Wetland restoration work will be performed during late summer and early fall, when natural vernal pools on the site are dry (approximately June 1 to October 15); restoration work will be supervised and monitored by a qualified biologist. Application of inoculum will occur either during construction activities or during the final phase of construction of the Vernal Pool Establishment Area before the wet season.

It is anticipated that all ground-disturbing activities for wetland restoration will be conducted using the following heavy equipment:

- Backhoe
- Grader
- Small dozer
- Paddle-wheel scraper
- Dump truck (two)
- Water truck
- Landscape tractor

Riparian rehabilitation and enhancement will be the before the winter rainy season begins. The riparian restoration activities will be limited to the use of hand tools, an auger mounted on a small tractor, and personal and light-duty trucks (to transport and plant riparian trees and shrubs).

The area will be mowed or grazed but not scraped or otherwise cleared at the start of the planting activities. Irrigation is expected to be required immediately after planting and for two or three seasons after planting. As an alternative or supplement to the proposed temporary irrigation system, a water truck may be used to transport onsite well water, as required, during the dry season from late spring through late fall. All work will occur outside the ordinary high-water mark and be limited to those areas along the river channel corridor where planting is deemed to have the greatest opportunity for success and will provide the greatest benefit.

During restoration activities on each site, equipment will be staged and stored within a designated area of approximately 100 feet by 100 feet outside of the Vernal Pool Establishment Area, Wetland Preservation Area, and Riparian Rehabilitation/Enhancement Area. Staging for each site will only occur on upland locations within each site after compliance with applicable general and species-specific conservation measures. Effects associated with staging are expected to be minimal and temporary.

Land grading and contouring will occur only within the Vernal Pool Establishment Area, where vernal pools will be restored. Vernal pool slopes will be constructed to mimic side slopes of natural vernal pools from a suitable design reference site, which will be selected from a location or (locations) within the Wetland Preservation Area or offsite locations, if appropriate. Example vernal pool slopes could range from approximately 2 percent to 6 percent, with a targeted mean average of approximately 3 percent, unless otherwise determined through further analyses (e.g., LIDAR analysis; remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light).

Excavation depths will vary for each vernal pool and be determined by vernal pool size, shape, slope, and position in the landscape and within the constituent vernal pool complex. Vernal pools will be restored to include outlet features (topographic not structural) that will limit ponding depth to better mimic the natural conditions in the design reference site. Vernal pool depths will generally range from 5 to 15 inches.

The following vernal pool construction process will be implemented:

1. A construction area will be identified (area will consist of individual pools or vernal pool complexes), and the topsoil will be scraped down 3 to 4 inches and stockpiled in an adjacent upland area.

2. Individual pools/complexes will be further excavated and contoured according to the design plan, with grades 3 inches below the final design grade.

3. Excavated (secondary) soils will be distributed around the vernal pool margins and contoured to mimic natural mima mound topography.

4. The junction between vernal pool boundaries and upland areas will be graded and contoured to ensure a smooth, natural wetland-upland transition.

5. Stockpiled topsoil will be redistributed across the construction site, including vernal pools and mounds, to provide a good substrate for plant establishment and growth.

6. No soil will be disposed of offsite. Exposed soil will be reseeded with naturalized plant seed (i.e., seeds appropriate to the site) to minimize erosion and invasive plant establishment.

7. Inoculum will be collected from natural vernal pools at the Wetland Preservation Site and distributed within the Vernal Pool Establishment Area.

8. Final finish grading will be performed for an overall natural, smooth contour for the restored vernal pools and mounds. Sufficient soil will be left above the hardpan for proper propagation potential for vernal pool plants (minimum of 2 inches).

Development of the Vernal Pool Establishment Area will require the temporary establishment of a storage and laydown area (i.e., the Staging Area). The Staging Area may include fuel and lubricant storage areas, which will be located at least 100 feet from water sources and sensitive areas. The Staging Area will be restored to pre-project conditions on completion of the vernal pool restoration.

Inoculum Collection, Inoculation, and Erosion Control (Vernal Pool Restoration Area, Wetland Preservation Area)

Minor and temporary ground disturbance will occur in order to collect inoculum (cysts for invertebrates and seeds for native plant taxa) from existing pools proposed for preservation. As described below, inoculum will be collected from 10 percent of the surface area of the donor pools (up to 0.76-acre) to a depth of no more than one inch. Temporary disturbance may also occur within the remaining area of the project site (up to 395 acres) in order to bring vehicles into the site for grading or transport personnel to the project.

When designing vernal pool creation, it is essential to balance the competing concerns of minimizing disturbance to existing donor pools and ensuring that sufficient inoculum is used to ensure success of both invertebrate and floristic species. If insufficient inoculum is used, scarified soil in the created pools may be colonized by invasive plant taxa that flourish in disturbed land cover. Removal of inoculum will be made by hand tools or by using small, light machinery (Bobcat 753, mower vacuum, shop vacuum, for example). All selections of light machinery will be approved by the Service prior to collection. Soil will be removed along transects so as not to remove all of the inocula soil from one specific area of the vernal pool. If possible, inoculum will be translocated the same day that it is collected. If storage is required, the inoculum will be kept dry and stored in a location where it will not be dispersed by the wind.

The FRA and the Authority propose to disturb no more than 10 percent of the existing pools, and collect inoculum no deeper than one inch. Where surface topography has small undulations, scraping to a depth of an inch may result in slightly less volume than predicted because of voids within the graded area. Assuming that the entire collection area yields the predicted volume,

removal of 0.76-acre of inoculum to a depth of one inch will yield 102.2 cubic yards (cy) allowing application of 10.22 cy per acre, a volume that will result in application of inoculum slightly less than one inch deep over the 10 acres proposed for creation. The Authority estimates that this is the minimum volume necessary to ensure success of vernal pool flora and fauna and to avoid colonization of disturbed surfaces by invasive taxa.

Restored vernal pools will be inoculated with a mix of soil, seeds, and organic material collected from natural vernal pools in the Wetland Preservation Area. The Wetland Preservation Area historically supported vernal pool fairy shrimp and vernal pool tadpole shrimp.

Suitable inoculum collection sites will generally be identified from pools or complexes within the Wetland Preservation Area that are deeper, with a high density of vernal pool indicator species, and where target species (vernal pool fairy shrimp, vernal pool tadpole shrimp) have been reported in the past.

Inoculum collected from vernal pools with documented vernal pool fairy shrimp will be stockpiled separately and placed in shallow, restored vernal pools that provide the preferred habitat for that species. Inoculum collected from vernal pools with documented vernal pool tadpole shrimp will also be stockpiled separately and placed into deeper, restored vernal pools that provide the preferred habitat for that species. All collected inoculum will be pooled to capture a range of genotypes and genetic diversity that are currently represented for each species within the Vernal Pool Preservation Area for translocation to the Vernal Pool Restoration Area.

The inoculum collected from these vernal pools will likely include aquatic invertebrate cysts and plant seeds. The inoculum will be collected in accordance with Service-approved methods to minimize disturbance. Inoculum will be collected manually or by using a small, rubber-tired tractor to minimize disturbance to the pool site. A Service-approved biological monitor will be present to directly supervise this activity at all times and ensure that there are no unanticipated impacts on natural vernal pools or upland habitats. The Service-approved biological monitor will specifically identify travel routes that avoid vernal pools and direct the tractor operator along these routes.

A maximum of 10 percent of the 7.6-acre donor vernal pool area will be used for topsoil (inoculum) collection. Topsoil will be collected from no greater than 1- inch in depth, which will provide ~102 cubic yards (CY) of inoculum, in order to minimize disturbance to the vernal pools. This will result in approximately 11.7 CY of topsoil per acre for the 10 acres of mitigation pools that will be seeded. Once inoculum is collected from a vernal pool, any scraped areas will be smoothed out in accordance with Service-approved methods that will minimize disturbance.

Silt fencing may be temporarily established as required or needed along the portions of the perimeter of the Vernal Pool Establishment Area where swales provide the potential for sediment runoff into Cross Creek. The silt fencing will consist of standard woven black fabric attached to wooden stakes and buried approximately 6 inches in the ground. If needed, straw wattles will be placed adjacent to the silt fencing or along swales to capture sediments. These materials will be

removed after one or two rainy seasons, depending on the extent of re-establishment of vegetation on the site.

Riparian Restoration (Riparian Rehabilitation/Enhancement Area)

Riparian habitat restoration will occur on 5.6 acres of riparian and 14.7 acres of riverine habitat within the Riparian Rehabilitation/Enhancement Area along Cross Creek. These activities will be accomplished by obtaining canes from donor trees (e.g., willow, cottonwood, valley oak, other native riparian trees, and associated native shrubs) either onsite or within the Cross Creek watershed (maximum of 10 canes per tree), a suitable ancillary collection site, or from a local, native plant nurseries. Nursery container plants will be used to supplement if needed. Collection will occur between November and February. Increasing the riparian habitat along Cross Creek will enhance the wildlife value of the habitat adjacent to the river and surrounding areas by providing shade, shelter, nesting sites, and foraging habitat. A planting plan will be submitted to the Service for review and approval prior to implementation.

Water required to support initial planting growth will be obtained from existing wells, relying on existing water rights. Establishment of plantings will require 3 years of supplemental watering, after which it is expected that plantings will have reached the water table. Holes for planting will be augured to maximum depth of 5 feet. A temporary irrigation system using aboveground plastic pipes to supply drip irrigation to the riparian plantings will also be installed and connected to the well(s). The temporary irrigation system installation will be monitored by a Service-approved biologist to ensure no impacts on sensitive resources occur. If necessary, the Service-approved biologist will have the authority to stop work to ensure that impacts on sensitive resources are avoided. Installation of the system will be done by hand using a utility truck to transport pipe to the restoration area. The temporary irrigation system will be removed when riparian plantings are sufficiently established and irrigation is no longer needed; maintenance of the system will occur as necessary with the system removed within two to three seasons after the first planting season.

Implementation and Mitigation Responsibilities

The FRA and the Authority will ensure that the FCMS has appropriate mitigation and monitoring plans in place. All plans will incorporate the principles of adaptive management, requiring the mitigation contractor and long-term manager to accommodate changing conditions, and incorporate new data, technologies, or better methods.

The FRA and the Authority will submit a final Fagundes Compensatory Mitigation Plan for review and approval by the Service that includes a site-specific mitigation work plan, maintenance plan, performance standards/success criteria, contingency planning, performance monitoring requirements, and a long-term management plan. These components have been developed early in the conceptual mitigation planning process (for the Draft Compensatory Mitigation Plan).

Long-Term Management

Areas within the FCMS will be protected with one or more conservation easements and managed in accordance with a long-term management plan (LTMP) adopted by the FRA and the Authority or the landholding entity. The LTMP, along with the conservation easement(s), will serve as the guiding documents for the maintenance, management, and monitoring of the FCMS The FRA and the Authority will submit the LTMP for the FCMS to the Service for review and approval prior to implementation. The LTMP, along with the conservation easement(s), will serve as the guiding documents for the maintenance, management, and monitoring of the FCMS
The purpose of the LTMP is to ensure the FCMS is managed, monitored, and maintained in a manner that conserves and sustains the native and sensitive resources that occur on the site. The LTMP will establish objectives, tasks, and priorities to monitor, manage, maintain, and report relevant habitat, land cover, and listed species on the site.

Conservation measures

The project proponent proposes to avoid or minimize effects to listed species and their respective habitats through the following conservation measures. Of these, applicable conservation measures that will be implemented at the FCMS will be described in the final Compensatory Mitigation Plan for that component of the project.

General Conservation Measures

1. **Qualified Project Biologists and Biological Monitors:** At least 15 days prior to the onset of activities, the FRA and the Authority will submit the name(s) and resumes of biologists and other qualified staff (e.g. biological monitors) who will conduct activities specified in the following measures. No project ground-disturbance activities will begin until proponents have received written approval from the Service that the biologists are approved to conduct the work, which approval shall be provided in 15 (calendar) days except under unusual or extraordinary cases. Qualified restoration ecologists, landscape architects, and special-status species experts may also be contracted, after Service approval, for assistance with implementation of proposed conservation measures.

2. **Regulatory Agency Access:** The contractor will allow access by the Service or other resource agency staff to the construction site. Due to safety concerns, all visitors will check in with the resident engineer prior to accessing the construction site.

3. **Prepare and Implement a Worker Environmental Awareness Program:** Construction contractor personnel who work onsite will attend a Worker Environmental Awareness Program (WEAP) training session. The environmental training will cover general and specific biological and legal information on federally listed species and their respective habitats. The training sessions will be given prior to the initiation of construction activities and repeated, as needed. Upon completion of the WEAP training, construction crews will sign a form stating that they attended the training and understand and will comply with the information presented. Updates and synopsis of the training

will be provided during the daily safety ("tailgate") meeting. Construction crews will be informed during the WEAP training that, to the extent possible, travel within the marked project site will be restricted to established roadbeds. A fact sheet prepared by the Service-approved project biologist conveying this information will be prepared for distribution to the construction crews. Maintenance crews will be required to attend a contractor education and environmental training class annually.

4. **Prepare and Implement a Restoration and Revegetation Plan:** During final design, the Service-approved project biologist will prepare a restoration and revegetation plan (RRP) for upland communities. The RRP will be submitted to the Service for review and approval. This will be a complement for site restoration in addition to the temporary effects for riparian plant communities and for jurisdictional waters. The RRP will address impacts to habitat subject to temporary ground disturbances, such as de-compaction or regrading. The Service-approved project biologist will approve the seed mix for revegetation. During construction activities, the contractor will implement the RRP in temporarily disturbed areas. The Service-approved project biologist will prepare and submit compliance reports to document implementation of this measure to the Service.

5. **Prepare and Implement a Biological Resources Management Plan:** Prior to construction activities, the Service-approved project biologist will prepare the Biological Resources Management Plan (BRMP) and assemble the biological resources conservation and mitigation measures.

6. **Prepare and Implement a Weed Control Plan:** Prior to construction activities, the contractor will prepare and implement a Weed Control Plan (WCP) to minimize or avoid the spread of weeds during construction activities. The contractor will implement the guidelines in the WCP during the project period and require that maintenance crews follow the guidelines in the WCP during the project period. The FRA and the Authority or its designee will appoint the responsible party for implementing the WCP during the operations period. The WCP will include the following:

    a. Schedule for conducting noxious weed surveys to be conducted in coordination with the BRMP.

    b. Success criteria for noxious and invasive weed control as established by a qualified biologist.

    c. Based on monitoring results, additional or revised measures may be needed to ensure the introduction and spread of noxious weeds is not promoted by the construction of the HST.

    d. Provisions to ensure that the development of the WCP will be coordinated with development of the RRP so that measures to reduce the spread and establishment

of noxious weeds and incorporates percent cover of noxious weeds into revegetation performance standards may be incorporated in the RRP.

7. **Pre-Construction Surveys.** The Service-approved project biologist will conduct preconstruction surveys for all properties not previously surveyed due to lack of access. All survey data will be provided to the Service prior to the initiation of ground disturbing activities. These surveys will determine the amount of direct and indirect effects to each species. Compensatory mitigation is proposed based on actual acres of direct effects and associated required compensatory mitigation.

8. **Biological Monitoring during Construction Activities.** The Service-approved project biologist will direct the work of Service-approved biological monitors who will be present onsite during key construction activities, including during ground disturbance activities and for all construction activities conducted within or adjacent to identified Environmentally Sensitive Areas (ESAs), wildlife exclusion fence zones (WEF), or non-disturbance zones to oversee permit compliance and monitoring efforts. The Service-approved biological monitor(s), as hired by the Design/Build Contractor, will advise the contractor on methods that may minimize or avoid impacts on federally-listed species.

9. **"Take" Notification and Reporting.** The Service and the California Department of Fish and Wildlife (CDFW) will be notified within 24 hours, via telephone and email, after discovery of a project-related accidental death or injury to a federally or state-listed species during project-related activities. The BRMP will determine all Service-approved individuals responsible for take notification and reporting. .

10. **Environmentally Sensitive Areas, Wildlife Exclusion Fencing and Non-Disturbance Zones.** Fencing will be used to establish non-disturbance exclusion zones to restrict construction equipment and personnel from ESAs or restrict federally-listed wildlife species from entering the construction areas. The non-disturbance zones will be determined through consultation and permitting with the various natural resources regulatory agencies.

    Two types of fencing, high visibility ESA fence and WEF, will be used for these purposes. ESA fencing will be identified and depicted on the project plans and delineated in the field by the Service-approved project biologist or Service-approved biological monitor (s). The contractor will ensure that all ESA areas are off-limits to construction personnel and equipment.

11. **Monofilament Restrictions.** During construction activities, the Service-approved biological monitor(s) will verify that the Contractor is not using plastic mono-filament netting (erosion-control matting) or similar material in erosion control materials. Non mono-filament substitutes including coconut coir matting, tackified hydroseeding compounds, rice straw wattles (e.g., Earthsaver wattles: biodegradable, photodegradable,

burlap), reusable erosion, sediment, and wildlife control systems that may be approved by the regulatory agencies (e.g., ERTEC Environmental Systems products) may be used.

12. **Avoidance of Entrapment.** At the end of each work day, all excavated, steep-walled holes or trenches that are more than 8 inches deep will be covered at the close of each day with plywood or similar materials or provided a minimum of one escape ramp per 10 feet of trenching constructed of fill earth. Before such holes or trenches are filled, they will be thoroughly inspected for trapped wildlife by the Service-approved biological monitor(s). All culverts or similar enclosed structures with a diameter of 4 inches or greater that are stored at a construction site will be inspected for wildlife before the pipe is subsequently used or moved.

13. **Artificial Dens Along the Wildlife Exclusion Fencing and Dedicated Wildlife Crossing Structures.** To mitigate the temporary impacts of ESA and WEF fencing on federally-listed species and their movement/migration corridors during construction, artificial dens will be installed along the outer perimeter of the ESA and WEF fencing. Artificial dens will also be installed at dedicated wildlife crossing structures to prevent predation by larger predators at wildlife undercrossings and to provide escape cover for wildlife, particularly the San Joaquin kit.

14. **Equipment Staging Areas.** Construction staging areas for storage of equipment and materials will be set up in areas that will ultimately be occupied by permanent HST facilities, such as the station sites or the HMF site. Additional staging areas may be sited based on the contractor's needs, access to local road networks, and highway access.

    Prior to construction activities, the contractor under the supervision of the Service-approved project biologist, will locate staging areas for construction equipment that are outside of areas of sensitive biological resources, including habitat for federally listed species, habitats of concern, and wildlife movement corridors, to the maximum extent possible. The Service-approved project biologist will prepare a memorandum documenting compliance with this measure.

15. **Construction Utility Requirements and Waste Disposal.** Contractors will temporarily store excavated materials produced by construction activities in designated areas at or near the construction site. Wherever possible, they will return excavated soil to its original location to be used as backfill and will dispose of waste materials associated with construction in local landfills permitted to take those types of materials. Material unsuitable for reuse will be hauled offsite to a permitted location in conformance with the Act.

16. **Cleaning Of Construction Equipment.** During construction, all equipment will be washed to remove mud and plant materials to avoid introduction of invasive species when working in areas that could support federally-listed species.

17. **Dewatering and Water Diversion.** If construction occurs where open or flowing water is present, a strategy approved by the resource agencies (e.g., Service, U.S. Army Corps of Engineers (Corps), State Water Resources Control Board (SWRCB) and CDFW) will be used to dewater or divert water from the work area.

18. **Construction Site Speed Limits.** To minimize dust levels and the potential for construction equipment to strike federally listed species, the Service-approved project biologist will restrict project vehicle traffic within the project footprint to established roads, construction areas, and other designated areas during ground-disturbing activities. The Service-approved project biologist will establish vehicle traffic in locations disturbed by previous activities to prevent further adverse effects, require observance of a 15-mph speed limit for construction areas with potential special-status species habitat, clearly flag and mark access routes, and prohibit off-road traffic.

19. **Work Stoppage.** During construction activities, the Service-approved project biologist or Service-approved biological monitors shall have stop work authority to protect any federally listed wildlife species within the project footprint. This work stoppage will be coordinated with the FRA and the Authority or its designee. The contractor will suspend ground-disturbing activities in the immediate construction area where the potential construction activity could result in "take" of listed species; work may continue in other areas. The contractor will continue the suspension until the individual leaves voluntarily, is relocated to an approved release area using Service- and/or DFW-approved handling techniques and relocation methods, or as required by the Service and the CDFW.

20. **Post-Construction Compliance Reports.** A post-construction compliance report, consistent with Service protocols and in compliance with the Act, will be submitted to the Service upon completion of each construction package, construction phase, permitting phase, or other portion of the HST section as defined by FRA and the Authority-contractor design/build contracts. The BRMP will determine the individual responsible for post-construction compliance reporting.

21. **Restoration of Temporarily Disturbed Areas.** Temporarily disturbed biological communities or habitats that could support federally-listed species or wetlands and other waters of the U.S. will be restored to pre-project conditions

22. **Compensatory Mitigation.** Habitat compensation for impacts to federally-listed species may include the creation, restoration, enhancement, and/or preservation of habitat. Habitat compensation may be accomplished by: 1) purchasing "credits" from a Service-approved conservation bank with a service area covering the impact area; 2) by acquiring appropriate properties in fee-title; or 3) by establishing a conservation easement over a property. If options 2 or 3 are selected, an endowment fund or comparable funding instrument will be established in order to manage the property for the benefit of federally-listed species in perpetuity. Success criteria will be developed with the Service if compensatory mitigation is done through the creation, restoration or enhancement of

suitable habitats. Additionally, a long-term management plan will be developed for the property. This plan will identify the monitoring, maintenance, management, and reporting requirements for the compensation site. All proposed habitat compensation sites, bank purchases, long-term management plans, conservation easements, and endowments will be submitted to the Service for review and approval before the plans are finalized and implemented. The proposed habitat compensation ratios for each species are discussed in the Species Specific Conservation Measures section below.

San Joaquin kit fox

1. The FRA and the Authority will follow the Service's *Standard Measures for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (Kit Fox Guidance) (Service 2011a). Minimization measures included in that document are summarized below.

    a. Prior to the start of construction activities, the Service-approved project biologist will conduct pre-construction surveys in accordance with the *San Joaquin Kit Fox Survey Protocol for the Northern Range* (Service 1999c). Pre-construction surveys for the kit fox will be conducted between May 1 and September 30 within the project in suitable habitat areas (alkali desert scrub, annual grassland, pasture, and barren) to identify known or potential San Joaquin kit fox dens. Pre-construction surveys will be conducted by a Service-approved project biologist within 30 days prior to the start of construction or ground disturbing activities and will be phased with project build-out. Reports for each survey will be submitted to the Service and the CDFW within 30 days of completion.

    b. Disturbance to all kit fox dens will be avoided to the maximum extent possible.

    c. During the breeding season (December 1 through July 31), all construction activities will be prohibited within the following limits:

        i. Non-natal den exclusion zone of 100 feet surrounding occupied/non-occupied non-natal dens.

        ii. Natal den exclusion zone of 200 feet for surrounding occupied/non-occupied natal dens.

    d. All construction activities near any occupied dens will cease one-half hour after sunset and will not begin earlier than one-half hour before sunrise, when feasible.

    e. A minimum of 5 days of den-monitoring is required to allow animals to vacate, during which time passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage movement out of the den.

f. After a non-natal den is determined to be unoccupied, it may be excavated under the direction of a Service-approved biological monitor at any time of year.

g. Vacant natal dens may be excavated only between August 15 and November 1 and after pups have vacated the den. If a kit fox is observed at the den during this period and construction activities within the non-disturbance exclusion zone of active San Joaquin kit fox burrows cannot be avoided, a Service-approved project biologist may initiate passive harassment measures in accordance with the Service's Kit Fox Guidance. Prior to passive harassment efforts, the project biologist will contact the Service and CDFW for approval.

h. If construction activities within the non-disturbance exclusion zone of active San Joaquin kit fox burrows cannot be avoided during the breeding and pupping season, the Service-approved project biologist will implement measures in accordance with the *Standardized Recommendations for Protection of the San Joaquin kit fox Prior to or During Ground Disturbance* following approval from the Service (Service 2011a).Destruction of any known natal or pupping den will not occur without approval from the Service. A minimum of five days of den-monitoring is required to allow animals to relocate, during which time passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage relocation. After a non-natal den is determined to be unoccupied, it may be excavated under the direction of a Service-approved project biologist following Service approval.

i. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been contacted for guidance. If necessary, and under the direct supervision of the Service-approved biological monitor, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

2. If a San Joaquin kit fox is detected within the project footprint during construction, a Service-approved biologist, in accordance with agency guidance, will request approval from the Service and CDFW to capture and relocate the kit fox.

3. The FRA and the Authority, in collaboration with the Service and CDFW, will develop and implement a monitoring program for use of the dedicated wildlife crossings by San Joaquin kit fox. The final monitoring plan will be reviewed and approved by the Service prior to implementation. The goal of the monitoring program will be to collect data on use of dedicated wildlife crossings by the San Joaquin kit fox, and other wildlife species. The data will also be used to determine the efficacy of the wildlife crossing in facilitating movement of San Joaquin kit fox under the HST and inform future wildlife crossing design alternatives that could be installed in other segments. The monitoring plan will be

implemented for five years and may be continued by mutual agreement between the FRA and the Authority, the Service, and the CDFW.

4. A Summary of the proposed habitat compensation, per conservation measures # 22, for the kit fox is provided below in Table 2.

Table 2. Proposed San Joaquin kit fox habitat compensation ratios.

San Joaquin kit fox Area	Habitat	Mitigation Ratio
Southwestern Tulare County Satellite Areas	Natural	3:1
	Developed	0.5:1
Metropolitan Bakersfield Satellite Area	Natural	3:1
	Developed	0.1:1
Recovery Plan-Linkage	Natural	3:1
	Developed	0.5:1
Other Areas (outside of Recovery Areas)	Natural	2:1
	Developed	0.1:1
Note: Natural includes: alkali desert scrub, annual grasslands, pasture, barren, and valley oak woodland habitats. Developed includes: agricultural lands (croplands, dryland grain fields, irrigated grain fields, irrigated row crops, orchards, hayfields, and vineyards) and urban areas.		

Fresno Kangaroo rat

1. **Implement Avoidance Measures for Fresno Kangaroo Rat.** Prior to the start of ground-disturbing activities, the Service-approved project biologist will conduct a habitat assessment on the identified parcels within the project footprint that may support the Fresno kangaroo rat to determine presence of kangaroo rat burrows or their sign.

2. If no burrows or signs of kangaroo rats are detected and kangaroo rats are confirmed to be absent from the project footprint, the following actions will be implemented:

    a. The Service-approved project biologist will install, maintain, and monitor exclusion fencing along the perimeter of the project footprint to ensure that no take of Fresno kangaroo rat or destruction of their potential habitat outside of the project footprint occurs.

    b. The Contractor will trim and clear vegetation to the ground by hand, using hand-operated equipment, or grazing animals (sheep, goats) to discourage small-mammal presence in the project footprint. The cleared vegetation will remain undisturbed by project construction equipment for 14 days to allow other small-

mammal species to passively relocate through the one-way exit/escape points along the wildlife exclusion fencing.

3. In the unlikely event that kangaroo rat individuals, their burrows, or signs of them are found within the project footprint during the habitat assessment, the Service and CDFW will be notified immediately and the FRA will reinitiate consultation to identify appropriate conservation measures to be implemented for this species.

Tipton Kangaroo rat

1. Prior to construction, a habitat assessment will be conducted in potentially suitable habitat (alkali desert scrub, annual grassland, pasture, barren) within the project footprint by the Service-approved project biologist to determine presence of kangaroo rat burrows or sign. The habitat assessment surveys will be conducted within 2 years, and no more than 14 days prior to the start of construction or ground disturbing activities, and may be phased with project build-out. If no burrows or sign of kangaroo rats are detected, no further measures will be required. Protocol-level surveys for the Tipton kangaroo rats will be conducted by Service-approved biologists with a valid 10(a)(1)(a) permit, in potentially suitable habitat areas where any burrows or sign are observed. The Service and the CDFW will be immediately notified if any Tipton kangaroo rats are discovered. A report for each protocol level survey for Tipton kangaroo rats will be submitted to the Service and the CDFW within 30 days of completion of the survey.

2. In areas where kangaroo rat burrows or sign are present, non-disturbance exclusion zones will be established at least 14 days prior to construction or ground disturbing activities. The fencing will be installed under the supervision of the Service-approved project biologist along the project footprint in potentially suitable habitat (alkali desert scrub, pasture, and annual grassland, barren). Fencing will be composed of a combination of both ESA fencing and WEF with one way exit/escape points.

3. The following additional measures may be implemented after the exclusion fencing is installed:

    a. In areas where kangaroo rat burrows or sign are present, vegetation will be trimmed and cleared to the ground by hand, hand operated equipment, or grazing animals (sheep, goats) to discourage Tipton kangaroo rat presence in the project footprint. The cleared vegetation will remain undisturbed by project construction equipment for 14 days to allow the species to passively relocate through the one way exit/escape points along the wildlife exclusion fencing, OR;

    b. A small mammal trapping and relocation plan in general accordance with the survey protocols in the California Valley Solar Ranch Project: Plan for Relocation of Giant Kangaroo Rats (*Dipodomys ingens*) (H.T. Harvey & Associates, 2011) will be prepared for Service review and approval and will incorporate agency recommended species specific measures as applicable. The

small mammal trapping surveys will occur within the project footprint in potentially suitable habitat (alkali desert scrub, pasture, annual grassland, and barren) that contain kangaroo rat burrows or sign. Trapping, with Service approval, will be conducted prior to construction and phased with project build-out; trapping will be limited to the dry, summer months on evenings when the nightly low temperature is forecast to exceed 50 °F. Small mammal trapping and relocation will be performed by a Service-approved biologist(s) with a valid 10(a)(1)(a) permit.

4. Impacts to suitable habitat for the Tipton kangaroo rat will be compensated for, per conservation measure # 22, at a 3:1 ratio through the purchase of Service-approved bank credits or through preservation of occupied habitat in perpetuity.

Central California tiger salamander

1. Prior to construction activities, the Service-approved project biologist will conduct a pre-construction survey of potential breeding and suitable upland habitat in the Cross Creek grassland region to determine the presence or absence of central California tiger salamanders within the project footprint. Surveys will be conducted no more than 30 days before the start of ground-disturbing activities and will be phased with project build-out. If any central California tiger salamanders are found, the Service-approved project biologist will immediately notify the Service.

2. The measures listed below will be implemented in the Cross Creek grassland region to avoid and minimize potential adverse effects to this species:

    a. The Service-approved project biologist will work in coordination with the Service to install, maintain, and monitor exclusion fencing along the perimeter of the project footprint to ensure that no take of central California tiger salamander or destruction of their potential habitat outside of the project footprint occurs.

    b. The Service-approved project biologist will install exclusion barriers (e.g. silt fences) to exclude central California tiger salamanders from construction areas. Exclusion fencing will be maintained by the contractor throughout the central California tiger salamander's entire active period (November to April) or until all construction activities are completed, whichever occurs first. Exclusion fencing must be trenched into the soil at least four inches in depth, with the soil compacted against both sides of the fence for its entire length to prevent central California tiger salamanders from passing under the fence. Barriers must be inspected by the Service-approved project biologist at least twice weekly on non-consecutive days outside of the breeding season. Barriers will be inspected daily following any rain event, and during months when juvenile central California tiger salamanders are most likely emigrating from their breeding ponds in search of burrows in surrounding upland habitat. Barriers will be installed by the contractor

with turn-arounds at any access openings needed in the fencing, to redirect central California tiger salamanders away from openings.

3. Non-disturbance exclusion zones will be established, maintained, and monitored by the Service-approved biological monitor(s) to ensure that take of central California tiger salamanders or destruction their potential habitat does not occur outside of the project footprint; fencing will be composed of a combination of high-visibility ESA fence and/or WEF.

4. Impacts to suitable upland habitat for the central California tiger salamander will be compensated for, per conservation measure # 22, at a 3:1 ratio through the purchase of Service-approved bank credits or through preservation of occupied habitat in perpetuity.

Blunt-nosed leopard lizard

1. Protocol-level surveys will be conducted by a Service-approved project biologist(s) in all suitable habitats (alkali desert scrub, annual grassland, barren, valley foothill riparian) within the project alignment one year prior to the start of construction following the California Department of Fish and Wildlife's *Approved Survey Methodology for the Blunt-Nosed Leopard Lizard* (CDFG 2004).

2. The Service-approved biological monitor(s) will conduct visual preconstruction surveys within the project footprint in areas of potential blunt-nosed leopard lizard habitat no more than 30 days prior to ground disturbing activities associated with each construction phase. The Service-approved biological monitor(s) will conduct daily surveys prior to construction activities to ensure blunt-nosed leopard lizards are not within the project footprint. Reports for each survey will be submitted to the Service and the CDFW within 30 days of completion.

3. During the active season (April 15 through October 15), in areas where blunt-nosed leopard lizards or blunt-nosed leopard lizard signs are present, the following measures will be implemented:

    a. Following the preconstruction survey for blunt-nosed leopard lizard within the project footprint, if active burrows or egg clutch sites are identified within the project footprint, the Service-approved Project Biologist will establish, maintain, and monitor 50-foot buffers around active burrows and egg clutch sites. The 50-foot buffers will be established around the active burrow and clutch sites in a manner that allows for a connection between the burrow site and the suitable natural habitat adjacent to the footprint so that blunt-nosed leopard lizard may leave the project footprint after the young have hatched. Project activities within the 50-foot buffers, including vegetation clearing and grubbing (as described below), will be prohibited until the eggs have hatched and blunt-nosed leopard lizard have been allowed to leave the project footprint, as determined by the Project Biologist.

b. Following the preconstruction survey for blunt-nosed leopard lizard within the project footprint, if no active burrows or egg clutch sites are identified within the project footprint, the Service-approved Project Biologist will conduct vegetation clearing and grubbing activities with hand tools. Cleared vegetation will be cut to 4 inches above the ground level, and all trimmings will be removed from the project footprint. The vegetation-free work area will be allowed to sit undisturbed for a minimum of 72 hours to allow blunt-nosed leopard lizards to passively relocate from the site. A follow-up preconstruction survey will be conducted in the vegetation-free work area to look for blunt-nosed leopard lizards or their sign. Any blunt-nosed leopard lizards observed during the follow-up survey will be allowed to leave the work site on their own accord. Immediately after the follow-up preconstruction survey of the vegetation-free work area, the project footprint will be delineated with high-visibility ESA fence and "a non-gaping, non-climbing barrier using a rigid and non-climbable material" wildlife exclusion fence. The vegetation-free work area within the wildlife exclusion fence will be maintained and monitored daily by the Project Biologist.

c. The Contractor will conduct ground-disturbing activities when air temperatures are between 75 and 95 degrees Fahrenheit. The temperature range corresponds to the period when this species is moving around and can avoid danger.

4. During the non-active season (October 16 through April 14), suitable blunt-nosed leopard lizard burrows identified during protocol-level and preconstruction surveys will be avoided by the Contractor. A 50-foot no-work buffer will be established around burrows to prevent impacts until the active season, when blunt-nosed leopard lizards will be able to leave the vegetation-free work area on their own accord. The no-work buffer will be established by routing the high-visibility ESA fence and wildlife exclusion fence around the suitable burrow sites in a manner that allows for a connection between the burrow site and the suitable natural habitat adjacent to the footprint so that blunt-nosed leopard lizard can leave the project footprint during the active season. If construction activities are required during this period, the appropriate measures will be established through consultation with the USFWS and CDFW.

5. If blunt-nosed leopard lizards are observed at any time during protocol-level surveys, preconstruction surveys, or the construction period, USFWS and CDFW will be contacted. Appropriate measures to avoid take of the species will be established through consultation with the USFWS and CDFW.

6. Non-disturbance exclusion zones will be established along the project footprint in potentially suitable areas (alkali desert scrub, annual grassland, barren, valley foothill riparian); fencing will be composed of a combination of both ESA high-visibility ESA fencing and wildlife exclusion fencing.

7. Non-disturbance exclusion zones will be maintained and monitored by the Service-approved biological monitor(s) to avoid the possibility for take of lizards, their burrows/nests, or the species' habitat outside of the project footprint.

8. Impacts to suitable upland habitat for the lizard will be compensated for at a 3:1 ratio through the purchase of Service-approved bank credits or through preservation of occupied habitat in perpetuity. Where possible, habitat preservation, per conservation measure # 22, will occur adjacent to the Pixley NWR and the Allensworth ER in order to ensure that large, contiguous blocks of blunt-nosed leopard lizard habitat are conserved.

Vernal pool fairy shrimp and vernal pool tadpole shrimp

To avoid and minimize potential adverse effects to the vernal pool crustaceans, the measures listed below will be implemented in the project footprint plus a 250-foot buffer where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur.

1. Non-disturbance exclusion zones will be maintained and monitored by a Service-approved biological monitor to ensure that take of vernal pool crustaceans or destruction their habitat does not occur outside of the project footprint where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur.

2. Initial construction activities in wetlands and other waters of the U.S. (e.g., vernal pools, seasonal wetlands, seasonal riverine areas, and riparian areas) will be restricted during the rainy season (October 15 to June 1). Construction may occur in these areas when there is no inundation, or the resource is dry or lacks flowing or standing water. In the event that construction work window restrictions cannot be conducted, dewatering, water diversions, or additional (BMPs) will be employed as determined through consultation with the Service, the Corps, CDFW, and the SWRCB, as applicable by regulating authority.

3. If construction activities must occur during the October 15 – June 1 period, initial ground disturbance activities will be scheduled to begin during the dry season, June 2 – October 14, to minimize the effects to vernal pool crustaceans and their habitat. If any work remains to be completed after October 15, exclusion fencing and erosion control materials will be installed to reduce sedimentation into vernal pool habitat.

4. Compensatory mitigation, per conservation measure # 22, will be provided for direct and indirect effects to vernal pool crustacean habitat. The ratios for these species will be based on whether the proposed mitigation is preservation or creation and on whether it occurs at an approved conservation bank or at a non-bank location. The compensatory mitigation ratios may range from 1.1:1 to 2:1 based on the guidance proposed in the 1996 U.S. Army Corps of Engineers, *Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans Within the Jurisdiction of the Sacramento Field Office, California* (USFWS 1996a).

Valley elderberry longhorn beetle

1. Protocol level presence/absence surveys for elderberry shrubs and signs of valley elderberry longhorn beetle exit holes, per the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b), will be conducted prior to construction activities within the project footprint and a surrounding 100-foot buffer.

2. If protocol-level surveys determine that elderberry shrubs occur within the project footprint plus a 100-foot buffer, then the contractor will install non-disturbance exclusion zone fences consisting of high-visibility ESA fence in compliance with the Service's 1999 *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*. The Service-approved project biologist will ensure that the protective measures set-forth in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* will be implemented within the 100-ft buffer.

3. The compensatory mitigation ratios, per conservation measure # 22, for this species may vary from 1:1 to 8:1, depending on the presence of exit holes, and may include the planting of additional associated native plants and the transplanting of directly affected elderberry shrubs during the dormancy period, as described within the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999).

California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly threads

1. The Service-approved Project Biologist will prepare a plan before the start of ground-disturbing activities to address monitoring, salvage, relocation, and propagation of federally listed plant species. The plan will include provisions that address the techniques, locations, and procedures required for the successful establishment of the plant populations. The plan will include provisions for performance that address survivability requirements, maintenance, monitoring, implementation, and the annual reporting requirements. The plan will be submitted to the Service for concurrence.

2. Protocol level, pre-construction botanical surveys for federally listed plants species will be conducted prior to any ground disturbing activities in areas where permission to enter was not available or where full protocol level botanical surveys were not conducted. Botanical surveys will be conducted in areas of suitable habitat.

3. Portions of the project footprint that support federally listed plants that will be temporarily disturbed will be restored on-site to pre-construction conditions. Prior to disturbance, pre-construction conditions will be documented detailing species composition, species richness, percent cover of key species, and photo points will be established.

4. All populations of federally listed plants species that will be directly affected will be documented. Documentation will include the density and percent cover of the species

and key habitat characteristics including soil type, associated species, hydrology, topography, and photo documentation of pre-construction conditions.

5. If a federally listed plant species is observed during protocol level, pre-construction surveys, compensatory mitigation will be provided at a 1:1 ratio based on actual acres of direct effects within the project footprint. Compensation will be accomplished by:

    a. Identification of suitable sites to receive the listed plants.

        i. Pixley National Wildlife Refuge, Allensworth Ecological Reserve/State Historic Park, Kern National Wildlife Refuge, Atwell Island, Alkali Sink Ecological Reserve, Semitropic Ecological Reserve, and Kern Water Bank;

        ii. FRA and Authority proposed Permittee-Responsible Mitigation Sites;

        iii. Or other locations approved by the Service.

    b. Collection of seeds, plant materials, and top soil from the project footprint prior to construction impacts.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the range-wide condition of the species included in this biological opinion, the factors responsible for that condition, and their survival and recovery needs of these species; (2) the *Environmental Baseline*, which evaluates the condition of the these species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of species current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild. The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the species and the role of the action area in the survival and recovery of the species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area includes the CHST-FB alignment footprint, lands surrounding it, and the 405-acre FCMS.

Several potential alignments have been identified in the Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement for the proposed project. These alternatives include varying siting for not only rail alignments, but also other project infrastructure, including passenger stations, power delivery structures, maintenance-of-way facilities, operations control centers, and a HMF. Since an alternative has not been selected to date, this biological opinion includes a project description and effects analysis for all alternative alignments, and assesses effects to federally-listed species based on a range of impacts from minimum to maximum (expressed in acreages). Regardless of the final alignment selected, project impacts will be similar geographically as well as in general nature and magnitude.

The project footprint extends to the physical limits of the construction activities associated with the proposed action. The project footprint includes all areas that will be permanently or temporarily affected by the proposed action. The footprint consists of the limits of cut and fill plus all access roads and areas required for operating, storing, and refueling construction equipment. The estimated project footprint for the CHST-FB Project alignment is expected to be no greater than approximately 7,189acres.

The estimated length of the Fresno to Bakersfield alignment will extend up to 117 miles. The area affected by disturbance from noise and vibrations, dust, and lighting during project construction is expected to extend up to 1,000 feet from both sides of the track. Associated project structures, such as roadway improvements, overcrossings, related ancillary facilities, and other permanent project elements, are included in the estimated project action area for the CHST-FB Project. The project action area for the Fresno to Bakersfield alignment, including the project footprint and the 405-acre FCMS is estimated to be no greater than 48,856 acres, which will be considered for the purposes of this opinion.

Status of the Species

San Joaquin kit fox

For the most recent status of this species please refer to the 5-Year Review published in 2010 (Service 2010a).

In addition to information provided in the 5-Year Review (Service 2010a) for this species, the Service has become aware of new information regarding the status of this species provided below:

Greater than 80 percent of high quality San Joaquin kit fox habitat in the southern san Joaquin Valley is privately owned (Orman and Phillips 2011; Cypher et al. 2013). Conversion of these lands to croplands and orchards (primarily almond and pistachio) is occurring at an increasingly rapid pace, resulting in reduced availability of high quality habitat for use by San Joaquin kit foxes every year (Cyper et al. 2013).

Tipton kangaroo rat

For the most recent status of this species please refer to the 5-Year Review published in 2010 (Service 2010b).

Blunt-nosed leopard lizard

For the most recent status of this species please refer to the 5-Year Review published in 2010 (Service 2010c).

Central California tiger salamander

Listing Status: On May 23, 2003, we proposed to list the Central California Distinct Population Segment (DPS) of the central California tiger salamander as threatened (Service 2003a). At that time we also proposed reclassification of the Santa Barbara County DPS and Sonoma County DPS from endangered to threatened (Service 2003a). In the same notice we also proposed a special rule under section 4(d) of the Act to exempt take for routine ranching operations for the central California DPS and, if reclassified to threatened, for the Santa Barbara and Sonoma County DPSs (Service 2003b). On August 4, 2004, we determined that the central California DPS of the central California tiger salamander was threatened (Service 2004) and that the Santa Barbara and Sonoma County populations were threatened as well, and reclassified the central California tiger salamander as threatened throughout its range (Service 2004), removing the Santa Barbara and Sonoma County populations as separately listed DPSs (Service 2009a). In the 2004 final rule, we also finalized the special rule to exempt take for routine ranching operations for the central California tiger salamander throughout its range (Service 2004).

On August 18, 2005, as a result of litigation of the August 4, 2004, final rule on the reclassification of the central California tiger salamander DPSs (*Center for Biological Diversity et al. v. United States Fish and Wildlife Service et al.*, C 04-04324 WHA (N.D. Cal. 2005), the District Court of Northern California sustained the portion of the 2004 rule pertaining to listing the central California tiger salamander as threatened with a special rule, but vacated the portion of the 2004 rule that re-classified the Santa Barbara and Sonoma DPSs to threatened status thereby reinstating their status as endangered. On August 31, 2011, the List of Endangered and Threatened Wildlife in part 17, subchapter B of Chapter I, title 50 of the Code of Federal Regulations (CFR) was amended to reflect the vacatures contained in the 2005 court order, classifying the Santa Barbara DPS and the Sonoma DPS of the central California tiger salamander as endangered, and the Central DPS of the central California tiger salamander as threatened with a special rule to exempt routine ranching operations from take (Service 2005a and 2011b).

Description: The central California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 8.2 inches (Petranka 1998). Tiger salamanders exhibit sexual dimorphism; males tend to be larger than females. The coloration of the central California tiger salamander is white or yellowish markings against black. As adults, central California tiger salamanders tend to have the creamy yellow to white spotting on the sides with much less on the dorsal surface of the animal, whereas other tiger salamander species have brighter yellow spotting that is heaviest on the dorsal surface. The larvae have yellowish gray bodies, broad fat heads, large feathery external gills, and broad dorsal fins extending well up their back and range in length from approximately 0.45 to 0.56 inches (1.14 to 1.42 centimeters) (Petranka 1998).

Distribution: Historically, the central California tiger salamander inhabited low elevation grassland and oak savanna plant communities of the Central Valley, and adjacent foothills, and the inner coast ranges in California (Jennings and Hayes 1994; Storer 1925; Shaffer *et al.* 1993). The species has been recorded from near sea level to approximately 3,900 feet (1188.7 meters) in the coast ranges and to approximately 1,600 feet (487.7 meters) in the Sierra Nevada foothills (Shaffer et al. 2004). Along the coast ranges, the species occurred from the Santa Rosa area of Sonoma County, south to the vicinity of Buellton in Santa Barbara County. The historic distribution in the Central Valley and surrounding foothills included northern Yolo County southward to northwestern Kern County and northern Tulare County.

The central California tiger salamander DPS occupies the Bay Area (central and southern Alameda, Santa Clara, western Stanislaus, western Merced, and the majority of San Benito counties), Central Valley (Yolo, Sacramento, Solano, eastern Contra Costa, northeastern Alameda, San Joaquin, Stanislaus, Merced, and northwestern Madera counties), southern San Joaquin Valley (portions of Madera, central Fresno, and northern Tulare and Kings Counties), and the Central Coast Range (southern Santa Cruz, Monterey, northern San Luis Obispo, and portions of western San Benito, Fresno, and Kern counties).

Status and Natural History: The central California tiger salamander has an obligate biphasic life cycle (Shaffer *et al.* 2004). Although the larvae salamanders develop in the vernal pools and ponds in which they were born, they are otherwise terrestrial salamanders and spend most of their postmetamorphic lives in widely dispersed underground retreats (Shaffer *et al.* 2004; Trenham *et al.* 2001). Subadult and adult central California tiger salamanders spend the dry summer and fall months of the year in the burrows of small mammals, such as California ground squirrels (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Because they spend most of their lives underground, central California tiger salamanders are rarely encountered, even in areas where they are abundant.

Central California tiger salamanders may also use landscape features such as leaf litter or desiccation cracks in the soil for upland refugia. Burrows often harbor camel crickets and other invertebrates that provide likely prey for central California tiger salamanders. Underground refugia also provide protection from the sun and wind associated with the dry California climate

that can cause excessive drying of amphibian skin. Although central California tiger salamanders are members of a family of "burrowing" salamanders, they are not known to create their own burrows. This may be due to the hardness of soils in the California ecosystems in which they are found. Tiger salamanders typically use the burrows of ground squirrels and gophers (Loredo *et al.* 1996; Trenham 1998a). However, pocket gopher burrows are most often used by Sonoma central California tiger salamanders in Sonoma County (D. Cook, pers. comm., 2001). Central California tiger salamanders depend on persistent small mammal activity to create, maintain, and sustain sufficient underground refugia. Burrows are short lived without continued small mammal activity and typically collapse within approximately 18 months (Loredo *et al.* 1996).

Upland burrows inhabited by central California tiger salamanders have often been referred to as "estivation" sites. However, "estivation" implies a state of inactivity, while most evidence suggests that central California tiger salamanders remain active in their underground dwellings. A recent study has found that central California tiger salamanders move, feed, and remain active in their burrows (Van Hattem 2004). Because central California tiger salamanders arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving, researchers have long inferred that central California tiger salamanders are feeding while underground. Recent direct observations have confirmed this (Trenham 2001; van Hattem 2004). Thus, "upland habitat" is a more accurate description of the terrestrial areas used by central California tiger salamanders.

Once fall or winter rains begin, the salamanders emerge from the upland sites on rainy nights to feed and to migrate to the breeding ponds (Shaffer et al. 1993; Stebbins 1989, 2003). Adult salamanders mate in the breeding ponds, after which the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Historically, the central California tiger salamander utilized vernal pools, but the animals also currently breed in livestock stockponds. Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer 1925; Twitty 1941). In ponds with no or limited vegetation, they may be attached to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). After breeding, adults leave the pool and return to the small mammal burrows (Loredo et al. 1996; Trenham 1998a), although they may continue to come out nightly for approximately the next two weeks to feed (Shaffer et al. 1993). In drought years, the seasonal pools may not form and the adults cannot breed (Barry and Shaffer 1994).

Central California tiger salamander larvae typically hatch within 10 to 24 days after eggs are laid (Storer 1925). The peak emergence of these metamorphs is typically between mid-June to mid-July (Loredo and Van Vuren 1996; Trenham et al. 2000) but in some areas as early as late February or early March. The larvae are totally aquatic. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson 1968). Larger larvae have been known to consume the pool tadpoles of Pacific treefrogs (*Pseudacris regilla*), Western spadefoot toads (*Spea hammondii*), and California red-legged frogs (*Rana draytonii*) (J. Anderson 1968; P. Anderson 1968). Central California tiger salamander larvae are among the top aquatic predators in seasonal pool ecosystems. When not feeding, they often rest on the bottom in shallow water but are also found throughout the

water column in deeper water. Young salamanders are wary and typically escape into vegetation at the bottom of the pool when approached by potential predators (Storer 1925).

The larval stage of the central California tiger salamander usually last three to six months, as most seasonal ponds and pools dry up during the summer (Petranka 1998). Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins 1973). Individuals collected near Stockton in the Central Valley during April varied from 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left the breeding pools 60 to 94 days after the eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. The longer the ponding duration, the larger the larvae and metamorphosed juveniles are able to grow, and the more likely they are to survive and reproduce (Pechmann *et al.* 1989; Semlitsch *et al.* 1988; Morey 1998; Trenham 1998b). The larvae will perish if a site dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1989) found a strong positive correlation with ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 pools sampled supported larval central California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only six (20 percent) provided suitable conditions for successful reproduction that year.

Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch *et al.* 1988; Scott 1994; Morey 1998). In the late spring or early summer, before the ponds dry completely, metamorphosed juveniles leave them and enter upland habitat. This emigration occurs in both wet and dry conditions (Loredo and Van Vuren 1996; Loredo *et al.* 1996). Unlike during their winter migration, the wet conditions that central California tiger salamanders prefer do not generally occur during the months when their breeding ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under these conditions, they may move only short distances to find temporary upland sites for the dry summer months, waiting until the next winter's rains to move further into suitable upland refugia. Once juvenile central California tiger salamanders leave their birth ponds for upland refugia, they typically do not return to ponds to breed for an average of 4 to 5 years. However, they remain active in the uplands, coming to the surface during rainfall events to disperse or forage (Trenham and Shaffer, 2005).

Threats: Documented or potential central California tiger salamanders predators include coyotes, raccoons, striped skunks, opossums, egrets, great blue herons, crows, ravens, garter snakes, bullfrogs, California red-legged frogs, mosquito fish, and crayfish.

The central California tiger salamander is imperiled throughout its range due to a variety of human activities (Service 2004). Current factors associated with declining central California tiger salamander populations include continued habitat loss and degradation due to agriculture and urbanization; hybridization with the non-native eastern salamander (Fitzpatrick and Shaffer 2004; Riley *et al.* 2003); and predation by introduced species. Central California tiger salamander populations are likely threatened by multiple factors but continued habitat fragmentation and colonization of non-native salamanders may represent the most significant

current threats. Habitat isolation and fragmentation within many watersheds have precluded dispersal between sub-populations. Other threats include predation and competition from introduced exotic species; possible commercial over-utilization; diseases; various chemical contaminants; road kill; and certain mosquito and rodent control operations. Currently, these various primary and secondary threats are largely not being offset by existing Federal, State, or local regulatory mechanisms. The central California tiger salamander is also prone to chance environmental or demographic events to which small populations are particularly vulnerable.

The Bay Area is located within the Central Coast and Livermore vernal pool regions (Keeler-Wolf *et al.* 1998). Vernal pools within the Coast Range are more sporadically distributed than vernal pools in the Central Valley (Holland 2003). This rate of loss suggests that vernal pools in these counties are disappearing faster than previously reported (Holland 2003). Most of the vernal pools in the Livermore Region in Alameda County have been destroyed or degraded by urban development, agriculture, water diversions, poor water quality, and long-term overgrazing (Keeler-Wolf *et al.* 1998). During the 1980s and 1990s, vernal pools were lost at a 1.1 percent annual rate in Alameda County (Holland 1998).

Due to the extensive losses of vernal pool complexes and their limited distribution in the Bay Area region, many central California tiger salamander breeding sites consist of artificial water bodies. Overall, 89 percent (124) of the identified water bodies are stock, farm, or berm ponds used by cattle grazing and/or as a temporary water source for small farm irrigation (CDFW 2011). This places the central California tiger salamander at great risk of hybridization with non-native tiger salamanders, especially in Santa Clara and San Benito counties. Without long-term maintenance, the longevity of artificial breeding habitats is uncertain relative to naturally occurring vernal pools that are dependent on the continuation of seasonal weather patterns (Shaffer in litt. 2003).

Shaffer *et al.* (1993) found that the East Bay counties of Alameda and Contra Costa supported the greatest concentrations of central California tiger salamander. Central California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins 2003). Central California tiger salamanders are under increasing pressure from habitat conversion and urbanization, development (i.e. Dublin Ranch, Fallon Village, Fallon Sports Park, Staples Ranch, and Shea Center Livermore), and infrastructure, utility and safety improvement projects (i.e. I-580 Eastbound HOV, I-580/Isabel Avenue Interchange, and I-580/Charro Avenue Interchange). The species' low recruitment and high juvenile mortality makes it particularly susceptible to habitat loss, fragmentation, urbanization, and construction related harm and mortality. Most of the central California tiger salamander natural historic habitat (vernal pool grasslands) available in this region has been lost due to urbanization and conversion to intensive agriculture (Keeler-Wolf *et al.* 1998). Central California tiger salamanders are now primarily restricted to artificial breeding ponds, such as bermed ponds or stock ponds, which are typically located at higher elevations (CDFW 2011).

Vernal pool fairy shrimp

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007b).

Vernal pool tadpole shrimp

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007c).

Valley elderberry longhorn beetle

For the most recent status of this species please refer to the 5-Year Review published in 2006 (Service 2006a).

California jewelflower

For the most recent status of this species please refer to the 5-Year Review published in 2013 (Service 2013).

Hoover's spurge

For the most recent status of this species please refer to the 5-Year Review published in 2009 (Service 2009b).

Kern mallow

For the most recent status of this species please refer to the 5-Year Review published in 2013 (Service 2013).

San Joaquin woolly-threads

For the most recent status of this species please refer to the 5-Year Review published in 2010 (Service 2010d).

Environmental Baseline

Geography, topography, and climate

The topography of the project area is relatively flat, with elevations in the project action area ranging from 203 to 430 feet above mean sea level. The elevation gradually decreases from approximately 300 feet from Fresno to 200 feet near Allensworth. From the vicinity of Allensworth, the elevation rises gradually to Wasco and Shafter, where it plateaus briefly (~ 350 feet) and then slightly rises into Bakersfield (~ 430 feet).

The San Joaquin Valley has an arid to semi-arid climate. Summers are generally hot and dry; the majority of the rainfall occurs during the mild winter months. Over 80 percent of annual precipitation occurs between November and April. Precipitation in the San Joaquin Valley and the eastern flanks of the interior Coast Range is limited due to the rain shadow effect of the Coast Range. Generally, annual rainfall amounts decrease from north to south across the valley floor. The mean annual precipitation records for the San Joaquin Valley range from nearly 16 inches in the north to less than 5 inches in the southern reaches of the valley (U.S. Geological Survey (USGS) 1998).

During the spring and summer, snowmelt from the Sierra Nevada provides the majority of the water for the San Joaquin Valley. Warm, moisture-laden air masses generated over the Pacific Ocean condense and cool as they are pushed upward over the Sierra Nevada, resulting in heavy precipitation on the western slopes. The resulting snow pack ranges from 20 to 80 inches as elevation increases from the lower foothills to the Sierran crest.

The northern and southern portions of the San Joaquin Valley are similar with respect to daily temperatures throughout the year. Northern and southern valley temperatures were collected at the National Climate Data Center stations in Fresno and Bakersfield. The average daily temperature in the project area (as measured in the coolest and hottest months) varies annually by about 36° degrees Fahrenheit (°F) between December (average air temperature of 46°F) and July (average air temperature of 83°F). Temperature extremes in the project action area have been recorded as high as 115°F and as low as 18°F (Western Region Climate Center 2010).

The San Joaquin Valley has a drainage area of approximately 34,100 square miles and is roughly divided into a northern San Joaquin River Basin and a southern Tulare Lake Basin. The project action area is located entirely within the Tulare Lake Basin. The Tulare Lake Basin is generally flat and used extensively for agriculture. The contributing rivers are normally diverted and dewatered before reaching the southern San Joaquin Valley floor (U.S. Department of Agriculture (USDA) 1982).

Most of the Tulare Lake Basin floor is underlain by several thousand feet of sediments, including coarse-grained, water-bearing zones. Groundwater exists under both unconfined and semi-confined conditions. Groundwater levels vary with seasonal rainfall, withdrawal, and recharge. Depth to groundwater in the valley ranges from a few inches to more than 100 feet. Recharge of the groundwater occurs through percolation of applied irrigation water and leaking water from agricultural ditches and through infiltration of stream flow.

All of the streams and rivers in the project action area have been dredged, culverted, diverted, dewatered, or channelized, or have had their active floodplains severely reduced by the construction of levees or the development of agricultural lands. Pumping of groundwater for large agricultural and urban demands has resulted in groundwater subsidence in many areas of the southern San Joaquin Valley, especially the western side and southern end.

Regular flooding is now largely controlled by dams, diversions, levees, and dredging. The previous floodplain and riparian habitat have been largely replaced by agriculture or urban

development (USDA 1982; Vileisis 1997). Evaporation of the historic Tulare, Buena Vista, and Kern lakes through water diversions and climate change has resulted in a wide area of saline-sodic soils on the southern San Joaquin Valley floor. Currently, this area continues to support the majority of wetlands in the project area.

Alterations to both surface water and groundwater in the region have resulted in a significant decline in the historical wetland area. This decline is reflected in the high proportion of drained or partially drained hydric soils mapped in the area. Most of the water is diverted into the irrigation canals that are found throughout the south San Joaquin Valley. Therefore, most of the water present in the project area is found in irrigation canals, water detention basins, precipitation-fed wetlands, and vernal pools; water is only occasionally found in river channels. The remaining wetlands are primarily unrelated to the historical floodplains or regional aquifers.

Vernal pools and seasonal wetlands within the project action area primarily occur in isolated depressions that receive water from precipitation and local surface and shallow subsurface flow or sheet flow. Water is retained in these depressions by a shallow perching layer (largely clay pans), and this water is unconnected or only partially connected to deeper groundwater layers.

Land use

There are an estimated 26,382 to 30,624 acres of agricultural lands within the project action area (Table 3). Agricultural croplands are the largest recorded habitat type within the project action area. Seven types of agricultural lands are present in the project action area: dry land grain crops, irrigated grain crops, irrigated hayfield, irrigated row and field crops, deciduous orchard, evergreen orchard, and vineyard. Agricultural lands with undetermined uses identified during surveys were generally classified as cropland. Some agricultural lands may support federally listed species such as San Joaquin lit fox, Fresno kangaroo rat, Tipton kangaroo rat, California tiger salamander, blunt-nosed leopard lizard, and some vernal pool branchiopods, and plant species.

Urban areas include municipalities, industrial, residential, and agricultural structures (e.g., feedlots and poultry farms), and adjacent dedicated areas (e.g., yards, roads, highways, parking lots, stockpiles). Fresno, Bakersfield, and multiple smaller cities in between, constitute the second greatest land use within the project action area (9,626 to 12,012 acres; Table 3). The majority of land in these urban areas is covered by impervious materials and surfaces. Native vegetation is absent or highly disturbed within urban areas, where typical vegetation consists of a variety of planted trees, such as eucalyptus (*Eucalyptus* spp.) and mulberry (*Morus* spp.), and other nonnative or ornamental vegetation.

Annual grasslands are the third most abundant habitat (2,514 to 2,960 acres; Table 3) present within the project action area, and are typically characterized by nonnative annual grass species. Dominant species include several species of brome (*Bromus* spp.), annual fescues (*Vulpia* spp.), oats (*Avena* spp.), and barleys *(Hordeum* spp.). Native species may be present but in lower densities, including goldfields (*Lasthenia* spp.), owl's clover (*Castilleja* spp.), tarweed (*Madia* spp.), pepperweed (*Lepidium* spp.), saltgrass *(Distichlis spicata)*, fiddleneck (*Amsinckia* spp.),

and popcorn flower (*Plagiobothrys* spp.). On occasion, shrub species, including saltbush (*Atriplex* spp.) may occur. Most annual grasslands in the project action area have experienced some level of disturbance in the past that was associated with the various agricultural practices, such as row cropping, or grazing. Although these grasslands typically have a history of disturbance, they continue to provide suitable habitat for a number of federally listed plant and wildlife species. Annual grasslands that have experienced lower levels of disturbance more often contain vernal pool habitat.

Lacustrine habitat (576 to 704 acres; Table 3) in the project action area is limited to human-made basins used for water storage and groundwater recharge. These basins typically have earthen berms, little or no emergent vegetation, and range in size from less than 1,000 square feet to hundreds of acres. No natural, permanent lakes occur in the project action area. Some basins may be partially bordered by willows (*Salix* spp.) and other riparian vegetation and support large colonies of nesting birds, such as cormorants (*Phalacrocorax* spp.) and great white egrets. Many of the smaller basins are surrounded by fences, which limit wildlife access. Although lacustrine habitats in the project action area are human-made and controlled, they provide important habitat for many wildlife species. The larger detention basins are used by a variety of water birds, swallows, and several species of duck.

The 468 to 571 acres of pasture land in the project action area consist primarily of un-irrigated fields actively grazed by cattle and horses within private property (Table 3). Generally, these areas can be characterized by a mix of annual grasses and other herbaceous species. Pastures may provide habitat to support federally listed wildlife species. Federally listed species potentially supported by pasture habitats include the San Joaquin kit fox, Fresno kangaroo rat, Tipton kangaroo rat, and some vernal pool branchiopods, and plant species.

Approximately 304 to 563 acres of alkali desert scrub occurs within the project action area, which is dominated by shrublands with understory cover of herbs and forbs and by vernal pools (seasonally inundated or saturated areas lacking a shrub layer). Primary plant species present in these communities include saltbush, iodine bush (*Allenrolfea occidentalis*), California joint-fir (*Ephedra californica*) goldenbush *(Isocoma acradenia*), and bush seepweed (*Suaeda moquinii*).

Typical herbaceous species include alkali heath (*Frankenia salina*), goldfields, Menzie's fiddleneck *(Amsinckia menziesii*), common tarweed (*Hemizonia pungens*), and saltgrass. This habitat is concentrated in the vicinity of Allensworth in relatively undisturbed areas. Alkali desert scrub provides the best example of native habitat for federally listed species in the in the project action area, such as the San Joaquin kit fox, the Fresno kangaroo rat, the Tipton kangaroo rat, and the blunt-nosed leopard lizard. Vernal pool features within alkali desert scrub may also support the California tiger salamander, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp.

Any area within the project action area with less than 2 percent total vegetation cover and less than 10 percent cover by tree or shrub species was characterized as a barren area. These areas were characterized as bare earth resulting from industrial activities (e.g., gravel extraction). Barren areas may support limited native wildlife or plant species. Approximately 331 to 485

acres were classified as barren areas within the project action area (Table 3). Brewer's blackbird (*Euphagus cyanocephalus*), killdeer, and western fence lizard may be present in barren areas. Federally listed species that may use barren habitat include San Joaquin kit fox, Fresno kangaroo rat, Tipton kangaroo rat, and blunt-nosed leopard lizard.

Riverine habitat in the project action area (~332 to 369 acres) is characterized by open water areas in canals and irrigation ditches and open water areas in the flow channel of rivers (e.g., the Kings and Kern rivers) and creeks (e.g., Tule, Cross, and Poso creeks) (Table 3). Due to extensive water diversion for agricultural purposes, riverine habitats within the project action area do not exhibit natural flow regimes and may be dry throughout a given year. Vegetation is either absent or sparse along sandy bottoms due to water-level fluctuations, vehicle disturbance, or maintenance activities in an irrigation canal or ditch. Typical vegetation, when present, is dominated by weedy species, such as mustards (*Brassicaceae*), and grasses.

Valley foothill riparian vegetation occupies about 102 to 133 acres of riparian corridors and associated floodplains or terraces of the Kings River, Cross Creek, Tule River, Poso Creek, and Kern River and along their associated sloughs and side channels within the project action area (Table 3). These riparian areas are characterized by a dominance of tall trees, including Fremont cottonwood (*Populus fremontii*), western sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). Subcanopy trees include white alder (*Alnus rhombifolia*) and ash (*Fraxinus* spp.). Understory shrub and herbaceous species typically include California blackberry (*Rubus ursinus*), elderberry (*Sambucus* spp.), and willows. In the project action area, the transition from the riparian corridor to valley foothill riparian vegetation, such as cropland or orchard is generally abrupt, resulting in narrow bands of vegetation restricted by the bordering agricultural land. Valley foothill riparian habitat provides food, water, migration and dispersal corridors, escape, nesting, and thermal cover for an abundance of wildlife.

Over 16 to 22 acres of fresh emergent wetland is present within the project action area as small patches associated with man-made structures, including detention basins, groundwater recharge reservoirs, and irrigation and drainage ditches (Table 3). Typical species in these areas include willows, rushes, bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and docks (*Rumex* spp.). A large complex of fresh emergent wetland exists in the vicinity of Cross Creek. Otherwise, fresh emergent wetland habitats outside of the Cross Creek area are typically small vegetated areas that experience year-round ponding from irrigation water or, less frequently, seasonally during winter rain events.

Approximately 8.35 acres of Valley oak woodland occurs along the floodplain of the Kings River and associated sloughs and side channels of the Hanford West Bypass 1 and 2 Alternatives (Table 3). This habitat is characterized by well-spaced stands of mature valley oak (*Quercus lobata*) with little or no sub-canopy and a well-developed herbaceous layer. Dominant herbaceous species include brome, annual fescues, oats, and barleys. Other herbaceous plants, including soap root (*Chlorogalum pomeridianum*), filaree, miner's lettuce, prickly ox-tongue

Table 3. Acreage of agricultural lands, urban areas, and vegetation communities within the project action area.

Habitat Type by Vegetation Community (California Wildlife Habitat Relationship System)	Acreage[a]		Percent Range[b]
	Minimum	Maximum	
Agricultural/cropland[c]	26,382.12	30,624.09	63.2 - 64.9
Urban	9,626.77	12,012.08	23.7 - 24.8
Annual grassland	2,514.80	2,960.45	6.1 - 6.2
Lacustrine	576.08	703.77	1.4 - 1.5
Pasture	468.81	570.85	1.2 - 1.2
Alkali desert scrub	304.94	563.28	0.8 - 1.2
Barren	331.53	484.93	0.8 - 1
Riverine	322.37	368.74	0.8 - 0.8
Valley foothill riparian	102.24	132.84	0.3 - 0.3
Fresh emergent wetland	16.54	22.19	<0.1 - 0.1
Valley oak woodland	8.35	8.35	<0.1
Total	40,654.55	48,451.57	—

[a] Minimum and maximum determined acreages based on the smallest and largest amount of acreage covered by any continuous combination of alternatives.

[b] Percent range based on minimum and maximum values compared with sum of all minimum and maximum values. The total acres do not match the total size of the RSA because they are based on a continuous alignment as opposed to all alternatives considered.

[c] "Agricultural/cropland" includes dryland grain crop, deciduous orchard, evergreen orchard, irrigated grain crop, irrigated row and field crop, irrigated hayfield, vineyard, and any other undetermined cropland.

(*Picris echioides*), and spiny sow thistle (*Sonchus asper*), may be present. In the project action area, valley oak woodland may intergrade with valley foothill riparian vegetation or abruptly transition to developed areas, such as cropland or orchard. Valley oak woodland provides food, cover, nesting sites, and dispersal habitat for a wide variety of wildlife. Federally listed species potentially supported by valley oak woodland habitat include San Joaquin kit fox, Fresno kangaroo rat, Tipton kangaroo rat, and central California tiger salamander.

Noise environment

The following discussion regarding the baseline noise levels within the project action area is based on information acquired through noise level studies presented in the California High-Speed Train Project Revised DEIR/Supplemental DEIS, Fresno to Bakersfield Section (Authority and FRA 2012a, pp. 3.4-17 to 3.4-25). Fresno and Bakersfield are the most densely populated cities within the proposed FB alignment, with several highways, busy local roads, UPRR, and aircraft noise contributing to the noise environment. Highway 99, Highway 180, and Highway 41 are all near the proposed HST station site in Fresno. Aircraft noise from three local airports adds to the existing noise environment in the Fresno area.

The area around the proposed station in Fresno is developed primarily with commercial and industrial land uses along with some residential land uses. The noise environment in this area is dominated by traffic on the local streets, traffic on the freeways that surround the downtown area, and noise from train operations along the Union Pacific Railroad mainline. Noise levels were measured at the noise-sensitive land uses throughout the area and the measured noise levels ranged from 61 dBA along one of the quieter streets to 72 dBA near the railroad. These noise levels are typical for urban settings dominated by vehicular traffic and railroad operations. The alternative alignment will proceed southeast from the Fresno station, pass State Route SR 41 and approach the BNSF rail yard. The sensitive land uses in this area are subject to more roadway and railroad noise; the noise levels measured here range from 68 to 75 dBA. A residence located adjacent to the existing railroad line experienced a noise level of 79 dBA. This site was dominated by train noise, with a total of 44 trains passing this location in a 24-hour period. Another residence farther south located approximately 900 feet from the existing railroad experienced a noise level of 58 dBA, which was significantly quieter.

The measured ambient noise levels of agricultural lands located near train operations ranged from 64 to 77 dBA. These noise levels are to be expected in areas near freight and passenger train operations. Noise levels in rural areas with road traffic ranged from 47 to 77 dBA. The median measured noise level for agricultural lands without train operations ranged from 36 to 44 dBA, which is comparable to the inside of a house during a quiet evening. Noise levels within agricultural areas where irregular farming activities may occur ranged from 48 to 77 dBA.

Noise measurements made along the alignment through the City of Corcoran ranged from 64 to 81 dBA. These noise levels are consistent with homes adjacent to commercial and industrial sites that are exposed to highway traffic and railroad operations. Around the eastern side of Corcoran, noise levels measured at homes away from SR 43 and other major roads ranged from 48 to 61 dBA.

The noise levels measured along the Pixley Alignment ranged from 59 to 70 dBA L_{dn}. These noise levels are consistent with expectations for homes along a two-lane highway and an active rail line. In the vicinity of Allensworth, the measured noise levels for residential areas near the BNSF right-of-way ranged from 62 to 76 dBA. The noise levels measured along the BNSF Alternative through the cities of Wasco and Shafter generally ranged from 70 to 79 dBA.

The land uses within the City of Bakersfield are primarily urban with roadways, freeways, and rail lines dominating the noise environment. The noise measurements conducted near the alternative alignments and the proposed downtown Bakersfield station alternatives in this area ranged from 59 to 70 dBA, which are consistent with an urban environment.

Surveys

Parcels within the project footprint that the FRA and the Authority was granted permission to enter were initially surveyed by biologists in 2010, with follow up surveys in 2011 and 2012. The purpose of the surveys was to determine which habitat types were present and identify potential project effects to federally-listed species. In accordance with the *Central Valley*

Biological Resource and Wetland Survey Plan (Authority and FRA 2009 and 2011) physical botanical and wildlife habitat assessment surveys and jurisdictional wetland delineation were conducted within the project footprint. The surveys were conducted within 60 to 120 feet of the HST footprint, depending on whether the track profile will be at-grade or elevated, and also within a 250-foot buffer around the project footprint where vernal pool habitat will be affected. Aerial photographic interpretation and windshield surveys were also conducted within a 1000-foot buffer around the project footprint to evaluate project effects to wide ranging wildlife and wildlife movement corridors.

In accordance with Service or California Department of Fish and Wildlife species-specific protocols, the study area was extended laterally from the project footprint up to 1.24 miles. Depending on target species, the extended study area identifies species-specific habitats based on aerial photographic interpretation, documented occurrences of the species, and field observations of federally listed species and their habitats.

Approximately 38 percent of the proposed project alignment has been surveyed to date. In areas that were not accessible, biologists conducted, to the extent possible, visual surveys of habitat types. Within unsurveyed areas, aerial photography was used to assess habitat types which were used to calculate the anticipated range of effects to federally-listed species habitat. The entire project alignment will be surveyed prior to construction to determine the effects of the project on federally-listed species, as described in further detail in the conservation measures above.

San Joaquin kit fox

The entire project action area occurs within the known geographic and historic range of the San Joaquin kit fox (Grinnell et al. 1937; Service 1998 and 2010; CNDDB 2012). Grinnell et al. (1937) identified three subspecies of kit fox based on morphological characteristics: *Vulpes macrotis mutica, Vulpes macrotis arsipus*, and *Vulpes macrotis macrotis*. Grinnell et al. (1937) included Fresno, Tulare, Kings, and Kern counties within the historic range of the San Joaquin kit fox (*Vulpes macrotis mutica*). The *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998) describes three core population areas, 12 satellite populations, and 21 linkages between satellite populations, and between core and satellite populations (Service 1998 and 2010a).

There are 663 extant occurrences of San Joaquin kit fox documented within Fresno, Tulare, Kings, and Kern counties (CNDDB 2013). The majority of these documented occurrences cluster within areas of natural habitat, such as Lokern, Carrizo Plain, Pixley National Wildlife Refuge, and Allensworth Ecological Reserve, and within and around metropolitan Bakersfield (CNDDB 2013; Cypher pers. comm., 2013). Of these, 144 occur outside of core or satellite populations or linkages. Documented occurrences of San Joaquin kit foxes become less common in the portion of the action area north of Hanford as the alignment extends towards Fresno.

San Joaquin kit foxes are expected to occur within all areas of suitable habitat throughout the CHST-FB project action area. An estimated 5,351 acres of habitat (alkali desert scrub, annual grassland, pasture, barren, urban Bakersfield, and agricultural lands) occurs within the 7,189-acre

CHST-FB Project alignment footprint. Approximately, 1,207 of the 5,351 acres (~23 percent) occur within satellite and corridor areas. Highly suitable habitat for the San Joaquin kit fox supports denning, foraging, and breeding; in the CHST-FB project action area it is composed of annual grasslands, alkali desert scrub, pasture, and barren land cover, as mapped for this project. Approximately 755 acres of the 5,351 acres (~14 percent) of habitat is considered highly suitable for use by the San Joaquin kit (Table 4). About 23 percent (~175 acres) of the 755 acres of highly suitable habitat occurs within satellite and corridors areas. The remaining 4,596 acres of San Joaquin kit fox habitat consists of agricultural and urban habitats between Fresno and Bakersfield (Table 4).

The Fresno to Bakersfield alignment crosses two satellite populations (Southwestern Tulare County and Urban Bakersfield) and one linkage area (between the Eastern Kern Grasslands and Antelope Plain/Semitropic/Kern satellite populations). San Joaquin kit fox habitat within and around the CHST-FB alignment project action area is fragmented by highways, roads, urbanization, and high-density agricultural lands (Cypher pers. comm., 2012; Cypher et al. 2014). Highly suitable habitat, which supports breeding, denning, and foraging for the San Joaquin kit fox, is extremely fragmented within and around the CHST-FB alignment project action area, occurring as isolated patches within high-density agricultural development (Cypher et al. 2013: Cypher et al. 2014). About 18 percent of these patches are too small to individually support a single San Joaquin kit fox home range (Cypher et al 2013). However, these small patches, collectively, provide habitat for San Joaquin kit foxes that rely upon availability of multiple small patches to survive (Cypher et al. 2013).

San Joaquin kit foxes within and around the Southwestern Tulare County satellite area tend to be concentrated within these fragmented patches of high quality habitat where increased intra-and inter-specific competition for resources occurs (Cypher et al. 2014). Home ranges tend to be smaller in the satellite populations than those observed in core populations, ranging from 593.1 to 1,210 acres (Cypher et al. 2014), versus 1,063 to 1,507 acres in core populations. Within home ranges in satellite populations, the minimum area used most frequently by individual San Joaquin kit foxes ranges from 222.4 to 296.5 acres (Cypher et al. 2014). Home range overlap among San Joaquin kit foxes is extensive within areas of highly suitable habitat in satellite areas (Cypher et al. 2014), which is expected to result in increased intra-and inter-specific competition for resources. Mortality rates range from 1.5 to 3.5 times higher in satellite populations than those observed in core areas (Cypher et al. 2014). This is attributed to increased competition and predation resulting from crowding of San Joaquin kit foxes within patches of highly suitable habitat, which are relatively limited in availability (Cypher et al. 2014).

The high rate of mortality observed among satellite populations of San Joaquin kit fox may also be a function of fragmentation of highly suitable habitat, which results in increased "edge" effect, increasing exposure to greater threats due to increased accessibility for predators and humans (Cypher et al. 2014). For example, free-ranging dogs (both domestic and feral), documented as a significant source of mortality for San Joaquin kit foxes, have been observed within fragments of highly suitable habitat in satellite and core areas (Cypher et al. 2014). Exposure to other threats, such as pesticide use on agricultural lands, also increases as edge effect increases.

Demographic information for San Joaquin kit fox primarily comes from core recovery areas and is limited from satellite populations (Cypher et al., 2014); little is known outside of these areas. Because the conditions described by Cypher et al. (2014) apply to highly fragmented habitat consistent with San Joaquin kit fox habitat conditions throughout the CHST-FB alignment project footprint, we expect San Joaquin kit fox to experience similar stressors throughout the action area (i.e., increased intra-and inter-specific competition and increased mortality rates).

Genetic studies can offer insight regarding the genetic status of populations and rates of genetically effective migration among populations within a given landscape (Schwartz et al. 2007). Population genetic studies can also provide valuable information, often unattainable through other approaches, for monitoring the baseline and status of species and contribute to conservation planning (Schwartz et al. 2007). Recent genetic studies of San Joaquin kit fox sampled from Bakersfield, Carrizo Plain, Lokern, Panoche, and Camp Roberts (archived samples from this location used) revealed high levels of genetic diversity in every sampling location (allelic richness, heterozygosity, and private alleles) (Wilbert pers. comm., 2012). Three unique genetic signatures were identified: northern type predominant in Panoche Valley, a western type common in Camp Roberts, Carrizo Plain, and Lokern, and an eastern type mostly in Bakersfield (Wilbert pers. comm., 2012). San Joaquin kit fox samples collected from the Panoche Valley were also distinct in that approximately half of that population has a unique mitochondrial DNA (mtDNA) haplotype with a 16-basepair (bp) deletion (Wilbert pers. comm., 2012). Previous research showed little sequence variation in the control region of the mtDNA, which led the researchers to use the length of this fragment (determined by number of basepairs in the amplified sequence) of the mtDNA to indicate that scat samples submitted to their study were actually collected from San Joaquin kit foxes. However, the Panoche individuals detected from samples collected during 2009 to 2011 were split between the 235 and 251 bp haplotypes (Wilbert pers. comm., 2012). Only one individual outside of the Panoche Valley (in the Carrizo Plain) has been detected with this haplotype (Wilbert pers. comm., 2012).

The F-statistic (*F*st) is a measure of genetic differentiation that ranges along a continuum of 0 to 1, with a value of 0 indicating that populations are genetically identical and a value of 1 indicating that they are 100 percent genetically distinct from each other. The *F*st value (*F*st = 0.06,) and estimated number of genetically effective migrants per generation (*N*m = 11; estimated from the *F*st value) between Bakersfield and the other two populations from their study suggests that while these populations exhibit genetic distinction from each other, moderate levels of gene flow among them do exist (Wilbert pers. comm., 2012).

This genetic distinction observed among San Joaquin kit fox sampled in Bakersfield and the other sites is also supported by previous research on the behavior and ecology of San Joaquin kit foxes in the urban habitat (Wilbert pers. comm., 2012; Cypher pers. comm., 2012 and 2013). Not only are these San Joaquin kit foxes living in an altered habitat, but they developed alternative behaviors, which have allowed them to adapt existence within the city (Wilbert pers. comm., 2012; Cypher pers. comm., 2012 and 2013).

The genetic data suggests that there is little effective current migration between the north group (Panoche) and other populations (Wilbert pers. comm., 2012). This is most likely due to the decreased population sizes, loss of intervening habitat, and loss of connecting populations

Table 4. Range of potential habitat for the San Joaquin kit fox.

Land Prioritization[1]	CWHR Vegetation Community or Wildlife Association	Impact Type	Areas of Effect (Acres)[2]	
			MIN	MAX
Southwestern Tulare County Satellite Area	**Natural**		**86.26**	**154.39**
	Annual Grassland	Direct	86.12	111.95
	Alkali Desert Scrub	Direct	0.07	37.4
	Barren	Direct	0	0
	Pasture	Direct	0.07	5.04
	Valley Oak Woodland	Direct	0	0
	Agriculture		**511.36**	**654.54**
	Agriculture/Crop	Direct	184.72	196.28
	Dryland Grain Crop	Direct	30.17	35.92
	Deciduous Orchard	Direct	228.81	243.09
	Evergreen Orchard	Direct	0	0
	Irrigated Grain Crop	Direct	10.69	75.75
	Irrigated Row and Field Crop	Direct	0	0
	Irrigated Hayfield	Direct	56.97	103.51
	Vineyard	Direct	0	0
	Urban/BNSF		**0**	**0**
	BNSF	Direct	0	0
	Urban development	Direct	0	0
Metropolitan Bakersfield Satellite Area (Urban Bakersfield)	**Natural**		**214.77**	**218.15**
	Annual Grassland	Direct	34.67	36.55
	Alkali Desert Scrub	Direct	10.13	11.14
	Barren	Direct	169.11	169.32
	Pasture	Direct	0.86	1.15
	Valley Oak Woodland	Direct	0	0
	Agriculture		**0**	**0**
	Agriculture/Crop	Direct	0	0
	Dryland Grain Crop	Direct	0	0
	Deciduous Orchard	Direct	0	0
	Evergreen Orchard	Direct	0	0
	Irrigated Grain Crop	Direct	0	0
	Irrigated Row and Field Crop	Direct	0	0
	Irrigated Hayfield	Direct	0	0
	Vineyard	Direct	0	0
	Urban/BNSF		**249.62**	**301.56**
	BNSF	Direct	13.5	13.67
	Urban development	Direct	236.12	287.89

Land Prioritization[1]	CWHR Vegetation Community or Wildlife Association	Impact Type	Areas of Effect (Acres)[2]	
			MIN	MAX
Linkage Area	**Natural**		**0**	**20.14**
	Annual Grassland	Direct	0	1.27
	Alkali Desert Scrub	Direct	0	0
	Barren	Direct	0	18.88
	Pasture	Direct	0	0
	Valley Oak Woodland	Direct	0	0
	Agriculture		**104.69**	**377.74**
	Agriculture/Crop	Direct	3.01	96.55
	Dryland Grain Crop	Direct	0	0
	Deciduous Orchard	Direct	88.81	92.49
	Evergreen Orchard	Direct	0	0
	Irrigated Grain Crop	Direct	7.9	25.8
	Irrigated Row and Field Crop	Direct	0	6.08
	Irrigated Hayfield	Direct	4.97	29.83
	Vineyard	Direct	0	126.98
	Urban/BNSF		**0**	**0**
	BNSF	Direct	0	0
	Urban development	Direct	0	0
Remainder Areas (Outside of Recovery Areas)	**Natural**		**164.34**	**361.88**
	Annual Grassland	Direct	111.05	183.14
	Alkali Desert Scrub	Direct	2.03	6.73
	Barren	Direct	28.58	134.24
	Pasture	Direct	22.69	37.77
	Valley Oak Woodland	Direct	0	0
	Agriculture		**1643.94**	**3262.83**
	Agriculture/Crop	Direct	159.49	516.12
	Dryland Grain Crop	Direct	34.85	77.8
	Deciduous Orchard	Direct	733.19	1199.27
	Evergreen Orchard	Direct	3.42	3.42
	Irrigated Grain Crop	Direct	160.47	382.44
	Irrigated Row and Field Crop	Direct	37.62	131.24
	Irrigated Hayfield	Direct	242.04	439.15
	Vineyard	Direct	272.84	513.41
	Urban/BNSF		**0**	**0**
	BNSF	Direct	0	0
	Urban development	Direct	0	0

1. Land Prioritization categories are based on the *Recovery Plan of the Upland Species of the San Joaquin Valley, California* (USFWS 1998) and the *San Joaquin kit fox 5-Year Review* (USFWS 2010).

2. The MIN-MAX tables presented within the Biological Assessment are not representative of any one alignment. The total acres of the table may exceed the project footprint because the sum of the maximum values is calculated across all potential project alignments.

between the north populations and the other groups sampled (Wilbert pers. comm., 2012). The remaining habitat between the western and eastern groups, although fragmented, has allowed for reduced but continued migration of individuals (Wilbert pers. comm., 2012). The highest observed rate of gene flow exists between the Bakersfield and the Lokern and Carrizo Plain populations (Wilbert pers. comm., 2012).

The number of genetically effective migrants ($Nm = 11$) may appear to be small number; however, what this value represents is a relative number of genetically-effective individuals that were able to move among the Bakersfield population and the western populations (Lokern and Carrizo Plains) and successfully breed over multiple generations. According to Mills et al. (1996) a minimum of one and a maximum of 10 genetically effective migrants per generation would be an appropriate general rule of thumb for minimizing the rate of loss of genetic diversity. Therefore, the San Joaquin kit fox populations within and around the project action area currently fit well within the parameters of these recommendations.

Tipton kangaroo rat

Between 367.18 and 453.85 acres of potentially suitable habitat, such as alkali desert scrub, annual grassland, barren and pasture land, for the Tipton kangaroo rat occurs within the project action area (Table 5). According to the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998), current populations occur in various communities along the SR 99 corridor from Tipton to Pixley, and in the Allensworth Ecological Reserve (AER) and Pixley National Wildlife Refuge (PNWR), which "provides some of the best remaining habitat for Tipton kangaroo rat." Tipton kangaroo rat was not observed during spring 2010 field surveys on properties where permission to enter was granted. Kangaroo rat sign, including active kangaroo rat-sized burrows with freshly excavated soils, fresh scat, and fresh tracks, were observed within the project action area south of the town of Allensworth. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

Seven occurrences of Tipton kangaroo rat have been documented within the project action area (occurrence #'s 9, 21, 24, 28, 29, 32, and 36; CNDDB 2013). A total of 41 occurrences of this species have been reported to the CNDDB within a 10-mile distance of the proposed project footprint (CNDDB 2013). Nine of these occurrences of Tipton kangaroo rat are documented within 1 to 2 miles of the project action area (occurrence #'s 20, 22, 23, 31, 35, 82, 83, 84, and 86; CNDDB 2013). Two of these 9 occurrences, documented in 1929 and 1976, are considered extirpated; however, the remaining 7 occurrences are presumed extant (CNDDB 2013). These 7 extant occurrences were reported from 1985 through 2003, and consist of observations of adults, including males and females, burrows, and breeding, wintering, and foraging sites (CNDDB 2013). All occurrences were observed in either alkali scrub or grassland habitat.

It is reasonably likely that the Tipton kangaroo rat may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within and around the project action area.

Central California tiger salamander

Between 0.01 and 5.5 acres of potentially suitable upland habitat for the Central California tiger salamander occurs within the project action area (Table 5). There is no vernal pool habitat to support breeding for the Central California tiger salamander within the portion of the action area where this species is likely to occur (Table 5). Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

Four Central California tiger salamander occurrences have been reported to the CNDDB within a 10-mile radius of the project footprint; of these, three have been reported within a 5-mile radius (CNDDB 2013). Occurrence # 583 includes two records reported together, and is northeast of the city of Fresno. Occurrence # 612 is located south of the city of Kingsburg and west of the city of Hanford, between Cole Slough and the Kings River. These historical records (occurrence #'s 583 and 612; CNDDB 2013) date back to the period between 1879 and 1936 and the occurrences are now considered extirpated. The third occurrence, # 522, was reported in 1999, in vernal pools associated with Cross Creek, located approximately 5 miles east of the city of Hanford (CNDDB 2013). This occurrence consisted of California tiger salamander egg masses observed in a complex of vernal pools surrounded by nonnative annual grasslands (CNDDB 2013). Designated critical habitat the Central California tiger salamander (Southern San Joaquin Region – Unit 5A) occurs within this same area, outside of the project action area.

It is reasonably likely that the Central California tiger salamander may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity to the project action area.

Blunt-nosed leopard lizard

Between 26.57 and 98.06 acres of potentially suitable habitat for the blunt-nosed leopard lizard, such as alkali desert scrub, annual grassland, barren lands, and valley foothill riparian occurs within the project action area (Table 5). Although this species was not observed during the spring 2010 field reconnaissance surveys, extensive small mammal burrows, which provide suitable refugia habitat for the blunt-nosed leopard lizard, were observed in the project action area in the vicinity of the AER. Suitable habitat for the blunt-nosed leopard lizard also occurs in the project action area between Deer Creek and Poso Creek, where suitable burrows for refugia have been observed. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

Over 50 occurrences of the blunt-nosed leopard lizard have been reported within a 10-mile distance of the project footprint. Seven of these occurrences are located within the project action area and presumed to be extant (occurrence #'s 12, 129, 194, 203, 204, 206, and 375; CNDDB 2013). These occurrences were reported between 1974 and 2005 in alkali desert scrub and annual grassland habitats (CDFW 2012). Blunt-nosed leopard lizards have also been reported in

the AER (CDFW 2012) and in the Deer Creek East Unit of the PNWR (Uptain et al. 1985; Service 2005b). In addition to the sightings at AER, blunt-nosed leopard lizard occurrences have been documented in the PNWR, near Poso Creek north of Wasco (Service 1998). because suitable habitat is present and CNDDB records indicate the presence of this species within and around the project action area.

Vernal pool fairy shrimp

The proposed project falls in the San Joaquin Valley Vernal Pool Region identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.* Vernal pools were documented to occur in the project action area, in the vicinity of the PNWR and AER (Service 2005b). Wetland delineation surveys identified between 2.33 and 29.77 acres of potentially suitable seasonal wetland and vernal pool habitat that could support the vernal pool fairy shrimp within the project action area (Table 5). During the spring 2010 field surveys, unidentified fairy shrimp (and seed shrimp, or common ostracods) were observed near Allensworth in vernal pools and seasonal wetlands in natural habitats dominated by alkali desert scrub and annual grassland. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

Nine vernal pool fairy shrimp occurrences have been reported to the CNDDB within 10 miles of the project footprint. The closest documented occurrences are located approximately 0.5 to 1 mile east of the project action area in seasonal wetlands within the PNWR and are both presumed extant (occurrence #'s 112 and 177; CNDDB 2013). In 1993, vernal pool fairy shrimp were found in vernal pools on the Two Well Unit of PNWR (Service 2005b), which is located approximately 3 miles east of the project footprint. The *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* also describes the species as occurring in the PNWR in Tulare County, and at isolated locations in Kings County (Service 2005c).

It is reasonably likely that the blunt-nosed leopard lizard is present within the project action area Approximately 54 square feet of vernal pool fairy shrimp designated Critical Habitat Unit 27B is within the project action area. However, that portion of the critical habitat unit does not contain the PCEs listed in the designations and is hydrologically and ecologically disconnected from the remainder of Critical Habitat Unit 27B by State Route 43 and the BNSF right-of-way.

It is reasonably likely that the vernal pool fairy shrimp may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity to the project action area.

Table 5. Range of potential habitat within the Fresno to Bakersfield alignment of the CHST Project (excluding the FCMS) for Tipton kangaroo rat, California tiger salamander, blunt-nosed leopard lizard, vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads.

Species	Habitat Type	Impact Type	Areas of Effect	
			MIN	MAX
Tipton kangaroo rat	Alkali desert scrub, annual grassland, barren and pasture	Direct	367.18	453.85
California tiger salamander	AQUATIC: Vernal pools/seasonal wetlands	Direct	18.6	18.7
	UPLAND: alkali desert scrub, annual grasslands, pasture surrounding vernal pools/seasonal	Direct	6.2	18.3
Blunt-nosed leopard lizard	Alkali desert scrub, annual grassland, barren and valley foothill riparian	Direct	26.57	98.06
Vernal pool fairy shrimp	Vernal pools / seasonal wetlands	Direct	2.33	29.77
		Indirect	14.55	103.52
Vernal pool tadpole shrimp	Vernal pools / seasonal wetlands (delineated within the geographic range of the species)	Direct	0.0041	0.0041
		Indirect	0.0560	0.0560
Valley elderberry longhorn beetle	Elderberry shrubs (*Sambucus* spp.)	Direct and Indirect	12 shrubs	36 shrubs
California jewelflower	Unsurveyed alkali desert scrub, annual grassland, and pasture in Fresno County	Direct	0	15
Hoover's spurge	Vernal pools / seasonal wetlands in Tulare County	Direct	0	6.35
Kern mallow	Unsurveyed alkali desert scrub, annual grassland, and pasture in Tulare and Kern Counties	Direct	0	214.36
San Joaquin woolly threads	Unsurveyed alkali desert scrub, annual grassland, and pasture in Fresno, Kings, and Kern Counties	Direct	0	489.34

Vernal pool tadpole shrimp

Wetland delineation surveys identified 0.0041 acre of potentially suitable seasonal wetland and vernal pool habitat that could support vernal pool tadpole shrimp within the project action area (Table 5). This 0.0041acre of vernal pool habitat falls within the southernmost extent of the

known range of this species. Portions of the project action area run parallel to the boundary of these reserves. Vernal pool tadpole shrimp were not observed during the spring 2010 field surveys. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

Five occurrences of vernal pool tadpole shrimp have been documented in Tulare County, two occurrences in Kings County, and three occurrences in Fresno County (CNDDB 2013). These occurrences constitute the southernmost extent of the vernal pool tadpole shrimp's known range. Three vernal pool tadpole shrimp occurrences have been reported near Cross Creek approximately 5 miles east of the city of Hanford (occurrence #'s 129, 139, and 140; CNDDB 2013). Hundreds of vernal pool tadpole shrimp were observed in vernal pools in a nonnative grassland area west of Cross Creek within the closest occurrence (occurrence #139; CNDDB 2013).

It is reasonably likely that the vernal pool tadpole shrimp may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity to the project action area.

Valley elderberry longhorn beetle

Surveys conducted in 2010 identified a limited number of elderberry shrubs that could provide habitat for the valley elderberry longhorn beetle. Based on survey results, between 12 and 36 elderberry shrubs are anticipated to occur within the project footprint (Table 5). Two elderberry shrubs were observed north of Layton, near Monmouth, outside of the riparian corridor. Ten shrubs were observed along the banks of the Kern River. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

There are 37 occurrences of valley elderberry longhorn beetle documented in Fresno, Kings, Tulare and Kern counties, most of which are located east Highway 99. Five of these occurrences have been documented within a 10-mile distance of the project footprint. The closest reported occurrence of valley elderberry longhorn beetle is located approximately 4 miles north of Bakersfield, where many elderberry shrubs with a few exit holes were observed in a riparian area along the banks of the Kern River (occurrence # 61; CNDDB 2013).

It is reasonably likely that the valley elderberry longhorn beetle may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity to the project action area.

California jewelflower

There are up to 15 acres of potentially suitable habitat for the California jewelflower within the portion of the project action area that falls within the historic range of this species (Table 5). Most of this habitat consists of alkali desert scrub, non-native and native annual grasslands,

barren lands, and pasture. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

There are 30 occurrences of California jewelflower documented in Fresno, Kings, Tulare and Kern counties (CNDDB 2013). Two occurrences are located within the project footprint, but are considered extirpated as a result of agricultural conversion (occurrence #'s 17 and 41; CNDDB 2013). All other CNDDB records of this species within 10 miles of the project action area are also confirmed as extirpated due to agricultural conversion and urban development, except for one, which is considered to be possibly extirpated (CNDDB 2013). This occurrence is located about 3.8 miles from the project action area near Bakersfield, along Caliente Creek, at the foot of the Tehachapi Grade, in Kern County (occurrence # 39; CNDDB 2013).

It is reasonably likely that the California jewelflower may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within and around the project action area.

Hoover's spurge

Hoover's spurge occurs within only one county, Tulare County, of the four surrounding the project action area. This population of Hoover's spurge is located outside of the project area and consists of 6 documented occurrences (CNDDB 2013). However, Hoover's spurge may occur where suitable habitat is found within the project action area. Collectively, up to 6.5 acres of potentially suitable habitat, consisting of vernal pool and seasonal wetland habitat for Hoover's spurge within the portion of the Fresno to Bakersfield alignment that occurs in Tulare County (Table 5). Hoover's spurge was not identified during botanical surveys conducted during 2010 in areas where access was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to other properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

The CNDDB contains no documented occurrences of Hoover's spurge within 10 miles of the project action area (CDFW 2012). However, historical occurrences of this species in Tulare County were recorded east of the city of Visalia (USFWS 2005b).

It is reasonably likely that the Hoover's spurge may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity to the project action area.

Kern Mallow

There are up to 214.36 acres of potentially suitable habitat for the Kern mallow within the project action area (Table 5). Most of this habitat consists of alkali desert scrub, non-native and native annual grasslands, barren lands, and pasture within Tulare and Kern counties. Protocol-level surveys for this species have not been conducted within the entire project action area because of

limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time.

One historical occurrence of Kern mallow was reported it within 1 mile of the project footprint (CNDDB 2013). This occurrence was found in a saline valley grassland community and is presumed extant, although it was last observed in 1962. Several occurrences of Kern mallow are reported from the Lokern area, between Buttonwillow and McKittrick, and are described as a single metapopulation (Service 1998). This area is approximately 30 miles west of the project action area.

During the early season botanical surveys, botanists investigated the previously known occurrences for the species; no documented Kern mallow populations were found. A population of mallow identified from the Jepson Manual as *Eremalche parryi* ssp. *kernensis,* was detected near the intersection of SR 155 and SR 43 in Kern County during the botanical surveys in May 2010. The species was recorded in a fallow field outside of the project action area (less than 500 feet away). The dominant cover in the field consisted of foxtail brome and pungent tarweed (*Hemizonia pungens*). The area appeared to have been heavily disturbed in the past.

Genetic studies of *Sidalcea and Eremalche* (*Malvaceae*) did not identify sufficient genetic distinction to fully resolve subspecies distinctions among *Eremalche* (Baldwin 2005; Andreasen 2005 and 2012). The species may be in the process of slowly diverging; and additional studies that include samples collected from other areas to further resolve subspecies distinctions are necessary to fully resolve subspecies distinctions (Baldwin 2005; Andreasen 2005 and 2012).

Recent morphological studies have confirmed that the only member of the genus *Eremalche* that is gynodioecious is Kern mallow. Therefore, any herbarium specimens of *Eremalche* with pistillate flowers in Tulare County should be identified as Kern mallow. Steven Hill determined in 2001 that a specimen collected near Delano in Tulare County, is indeed Kern mallow (occurrence #51, located within the project footprint; CNDDB 2013).

Based on the information provided by the recent genetic and morphological studies of *Eremalche*, the Service currently considers any occurrences with pistillate flowers in Tulare and Kern counties to be Kern mallow until further work provides convincing evidence that suggests we should reconsider our determinations.

It is reasonably likely that the Kern mallow may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within and around the project action area.

San Joaquin woolly-threads

There are up to 489.34 acres of potentially suitable habitat for the San Joaquin woolly-threads within the project action area (Table 5). Most of this habitat consists of alkali desert scrub, non-native and native annual grasslands, barren lands, and pasture within Fresno, Kings, and Kern counties. Protocol-level surveys for this species have not been conducted within the entire

project action area because of limited access to properties where suitable habitat may exist. San Joaquin woolly-threads were not observed during floristic surveys in the project action area that were conducted within Kern County in 2010. Therefore, the status of this species within the project action area is not known at this time.

There are 12 documented occurrences of San Joaquin woolly-threads within 10 miles of the project action area (CDFW 2012). Two of these occurrences are in the project action area. Nine of the 12 recorded occurrences, including the 2 occurrences that fall within the project action area, are extirpated or possibly extirpated due to agricultural and urban development (CNDDB 2013). Occurrence # 19, located about 10 miles southeast of the terminal end of the Bakersfield North and South segments, is presumed extant although no plants were observed at the site during 1986 and 1987 surveys of the area. Two occurrences near the Kern River, approximately 6 miles to 7 miles southwest of the project action area, were confirmed in 2009 (CNDDB 2013).

Several metapopulations of San Joaquin woolly-threads have been identified in the western San Joaquin Valley (USFWS 1998). The nearest of these occurrences to the project action area include populations near Lost Hills and Bakersfield in Kern County.

It is reasonably likely that the San Joaquin woolly-threads may be present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within and around the project action area.

FCMS: Environmental Baseline

The proposed 405-acre FCMS consists of two parcels along Cross Creek. These two parcels support grassland habitat with scattered vernal pool complexes. Cross Creek defines the southern boundary of Parcel A and the eastern boundary of Parcel B. The two individual parcels at the FCMS are connected by a narrow strip of land that parallels Cross Creek. This strip of land and the adjoining annual grasslands south of Cross Creek are privately owned, and the Fagundes family grazes these parcels (together with Parcels A and B of the proposed compensatory mitigation site) under a lease with the landowner. Cross Creek conveys stormwater runoff from the east in the winter and irrigation tail water during the spring and summer. The FCMS is surrounded by a combination of agricultural lands to the north and west and grasslands to the south (across Cross Creek) and immediately east. Vernal pool complexes are scattered throughout the grasslands on the FCMS.

The FCMS composes the southwestern end of a corridor of open space that is bisected by Highway 99 and surrounded by agricultural lands, primarily row crops. This corridor follows Cross Creek and is mapped as critical habitat for the central California tiger salamander, vernal pool tadpole shrimp, and vernal pool fairy shrimp. The FCMS has365.7 acres of upland habitat for the San Joaquin kit fox and the central California tiger salamander, 19 acres of vernal pool and seasonal wetland habitat for the central California tiger salamander, vernal fairy shrimp, and the vernal pool tadpole shrimp, and 14.7 acres of restored riparian and riverine habitat (Table 6).

Table 6. Acres of available habitat preservation and restoration within the FCMS.

Resource Type	Acreage Available
Vernal pool habitat	7.6 acres of preservation
	8.7 acres of restoration
Seasonal wetland habitat	2.7 acres of preservation
Riverine	14.7 acres of preservation
Upland habitat	365.7 acres of preservation

FCMS: Vegetation

Live Oak Associates, Inc. (LOA) evaluated the mitigation potential of both parcels and described the results in a 2001 report (LOA 2001). The report identifies four vegetation communities on the two parcels: alkali grassland, northern claypan vernal pools and swales, riparian habitat, and seasonal wetland drainages. The alkali grassland habitat primarily consists of non-native annual grasses typical of the region. The northern claypan vernal pools and swales habitat type is consistent with what the 2012 *Supplemental Preliminary Jurisdictional Waters and Wetlands Delineation Report, Volumes 1, 2, 3, and 4* classified as vernal pools, swales, and seasonal wetlands. The riparian habitat is discontinuous along Cross Creek. The *2012 Delineation Report* attributes this discontinuity in part to cattle grazing limiting recruitment of riparian vegetation. The seasonal wetland drainages occur in areas that may have once been former channels of Cross Creek.

The vernal pools on the FCMS are topographic depressions occurring within the annual grassland. The depressions are characterized by a hardpan soil layer that fills with rainwater, surface runoff, or overflow from Cross Creek and holds water during the rainy season. The depressions typically fill in December or January, and in wet years the water in the pools persists into late April or early May. In their 2001 report, LOA identified 77 vernal pools on the property in 2000. Typical plant species occurring in the pools include slender popcorn flower (*Plagiobothrys stipitatus*), dwarf wooly-heads (*Psilocarphus brevissimus* ssp. *brevissimus*), and swamp timothy (*Crypsis schoenoides*).

Currently, the portion of Cross Creek that runs through the FCMS supports very little riparian vegetation. Where riparian vegetation does occur on the property, it is degraded, consisting of scattered trees that provide little in the way of habitat value, creek shading, or nutrient enrichment.

FCMS: Hydrology and Soils

Cross Creek, which flows intermittently with stormwater runoff and irrigation tailwater, forms the southern border of Parcel A and the eastern border of Parcel B. Although some U.S. Geological Survey surface water monitoring stations are upstream on Cottonwood Creek (which becomes Cross Creek), these stations are over 20 miles away and are above the point where

Cottonwood Creek breaks into a more diffuse alluvial fan near the Fagundes Compensatory Mitigation Site. The flow levels in Cross Creek through the property are currently unknown and will need to be further investigated through field measurements.

The Natural Resources Conservation Service (NRCS) soil survey lists the soils within the parcels as primarily Melga silt loam, with some Remnoy very fine sandy loam and Youd fine sandy loam also occurring. These soils are derived from alluvium material and are notably characterized by a restrictive duripan layer at 10 to 20 inches. The soils are slightly saline and poorly drained (Natural Resources Conservation Service 2012).

FCMS: Climate

Precipitation in the area averages about 10 inches per year (1985–2012). The range of annual precipitation during this period was 4.1 inches in the driest year and 20 inches in the wettest year. Peak rainfall occurs in December through March; little precipitation occurs from June to September (Western Regional Climate Center (WRCC) 2012). Average temperatures in the area range from 37 to 55 degrees Fahrenheit in January and 65 to 97 degrees in July (period of record is 1927–2005) (WWRC 2012). Due to the general high temperatures in the area, the evapotranspiration rates are also high, approximately 0.9 inches/month in December and 8 inches/month in July (California Irrigation Management Information System 1999).

The data reviewed by the FRA and the Authority and its Regional Consultants suggests that precipitation is sufficient to support the establishment, rehabilitation, enhancement, and restoration of vernal pools on the FCMS that will meet the USACE guidelines for ponding (i.e., at least 19 days a year in 5 of 10 years). It is presumed that if depressions were created on the property to support the appropriate wetland hydrology, other vernal pool characteristics, including vegetation, soils, and wildlife will be supported.

FCMS: San Joaquin kit fox

Approximately 365.7 acres of highly suitable grassland habitat for the San Joaquin kit fox exists within the FCMS (Table 6). There are documented occurrences of the San Joaquin kit fox in close proximity to the FCMS (CNDDB occurrence #'s 920, 921, 923, and 924).

It is reasonably likely that the San Joaquin kit fox is present within the FCMS because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity of the FCMS.

FCMS: central California tiger salamander

There are 365.7 acres of suitable upland habitat and 7.6 acres of vernal pool habitat to support the central California tiger salamander within the FCMS (Table 6). There is a documented occurrence of central California tiger salamander within 5 miles of the FCMS (CNDDB occurrence # 612). Egg masses reported as central California tiger salamander were observed in vernal pools located within the FCMS during surveys (CNDDB occurrence # 522) (Live Oak

Associates, Inc. 2001). Small mammal burrows are present within the upland habitat of the FCMS. However, adult central California tiger salamanders have not been observed during surveys. The FCMS is located within the reported range for this species and provides suitable aquatic and upland habitat for this species.

It is reasonably likely that the central California tiger salamander is present within the FCMS because suitable habitat is present and CNDDB records indicate the presence of this species within the FCMS and within close proximity.

FCMS: Vernal pool fairy shrimp

There are 7.6 acres of suitable vernal pool habitat to support the vernal pool fairy shrimp within the FCMS (Table 6). Two observations of vernal pool fairy shrimp have been reported on the Fagundes Compensatory Mitigation Site, which document hundreds of vernal pool fairy shrimp observed during surveys (CNDDB #'s 206 and 207).

It is reasonably likely that the vernal pool fairy shrimp is present within the FCMS because suitable habitat is present and CNDDB records indicate the presence of this species within the FCMS.

FCMS: Vernal pool tadpole shrimp

There are 7.6 acres of suitable vernal pool habitat to support the vernal pool tadpole shrimp within the FCMS (Table 6). Two observations of vernal pool fairy shrimp have been reported on the Fagundes Compensatory Mitigation Site, which document hundreds of vernal pool tadpole shrimp observed during surveys (CNDDB #'s 139 and 140).

It is reasonably likely that the vernal pool tadpole shrimp is present within the FCMS because suitable habitat is present and CNDDB records indicate the presence of this species within the FCMS.

Effects of the Proposed Action

The CHST-FB Project will result in temporary and permanent loss of habitat for the San Joaquin kit fox, the Tipton kangaroo rat, the central California tiger salamander, the blunt-nosed leopard lizard, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the California jewelflower, the Hoover's spurge, the Kern mallow, and the San Joaquin woolly-threads.

San Joaquin kit fox

Effects associated with construction activities

Direct and indirect effects are reasonably likely to occur to the San Joaquin kit fox within the 48,452-acre project action area (Table 3). The Services anticipates that adverse effects to the San

Joaquin kit fox from construction activities are expected to occur within the project footprint and within 200 feet of on either side of the project footprint (11,536 acres). The maximum estimated acres (5,351) of potentially suitable habitat (alkali desert scrub, annual grassland, pasture, barren, urban Bakersfield, and agricultural lands) for the San Joaquin kit fox that may be permanently lost as a result of the CHST-FB Project will be considered in this effects analysis for the San Joaquin kit fox. However, the Service recognizes that the actual number of acres of habitat that will be lost may be lower than the estimate considered in this biological opinion, depending on the alternative selected for the CHST-FB Project.

The potentially suitable habitats occur as fragments or patches throughout the relatively narrow, linear project action area, primarily within Fresno, Tulare, Kings, and Kern Counties. Approximately 755 acres of the 5,351 acres (~ 14 percent) of suitable habitat is considered to be highly suitable for use by the San Joaquin kit fox (alkali desert scrub, annual grassland, pasture, barren lands, summed from Table 4). The remaining 4,596 acres of San Joaquin kit fox habitat consists of agricultural and urban habitats between Fresno and Bakersfield (Table 4). The 755 acres of highly suitable habitat that will be permanently lost as a result of the CHST-FB Project represents an extremely small fraction of the remaining highly suitable habitat within Fresno, Tulare, Kings, and Kern Counties (Cypher, pers. comm., 2013).

Habitat loss and alteration may occur through degradation and placement of hardscape over suitable denning or foraging habitat as a result of the CHST-FB alignment component of the project. It is reasonably likely that construction activities will result in the destruction of dens. Highly suitable habit that supports denning and breeding is essential for persistence of San Joaquin kit fox populations (Service 2010; Cypher et al. 2013; Cypher et al. 2014). Approximately 755 acres of high quality habitat for the San Joaquin kit fox will be permanently lost as a result of the CHST-FB alignment project action area. High quality habitat is already extensively fragmented throughout the CHST-FB alignment component of the project action area. Although the total habitat loss will be spread out over the length of the alignment, the permanent loss resulting from the 100-foot wide CHST-FB alignment footprint will decrease available resources for San Joaquin kit foxes utilizing those areas.

We expect any San Joaquin kit foxes using any patch of highly suitable habitat in the project footprint to be adversely affected by the loss of this habitat wherever it occurs. The loss of highly suitable habitat, even though fragmented, will exacerbate stresses caused by currently limited habitat availability, thus resulting in harm to an unknown number of San Joaquin kit foxes throughout the project footprint. Permanent alteration and loss of highly suitable habitat that supports foraging, breeding, and denning is reasonably likely to result in harm to individual San Joaquin kit foxes through increasing already high levels of intra-specific competition among San Joaquin kit fox and interspecific competition for resources with other carnivores such as coyotes (Cypher et al. 2013; Cypher et al. 2014). Additionally, the loss of highly suitable habitat is expected to result in some kit foxes having to forage over larger areas of less-suitable habitat, thereby increasing the risk of predation from coyotes, dogs, and bobcats, as observed in other studies (White and Ralls 1993; White et al. 1995; Cypher et al. 2013). A reduction in prey is expected to result in fewer and/or smaller litters, and decreased pup survival, and reduced survival rates for juvenile and adult San Joaquin kit fox.

The proposed construction activities have the potential to expose San Joaquin kit fox to a range of adverse effects. Loud noise, lighting, and vibration caused by construction vehicles, equipment, and operation of the HST system may disrupt normal breeding, feeding, or sheltering behaviors of San Joaquin kit fox individuals. Disruption of normal behaviors, as described above, may result in a likelihood of injury or mortality of San Joaquin kit fox. Direct mortality of kit fox may occur as a result of collision with construction vehicles or equipment. Displaced individuals may be more vulnerable to predation. However, the FRA and the Authority has proposed to implement conservation measures such as minimizing the total area disturbed by project activities, enforcement of speed limits, and wildlife exclusion fencing, which will reduce the potential for mortality, injury, or harassment of the San Joaquin kit fox. Preconstruction surveys for San Joaquin kit fox will reduce the potential for injury or mortality as well. Therefore, injury or mortality from entrapment, behavioral disruption from noise and vibrations, or collision with construction equipment and vehicles is not expected to occur.

FCMS: Construction Activities for Habitat Restoration

Construction and inoculum collection activities associated with the proposed wetland and riparian restoration will occur within the 405-acre FCMS (Table 6). Construction equipment, such as a Bobcat 753, mower vacuum, or shop vacuum will be used to collect inoculum from donor pools within the 7.6-acre Vernal Pool Preservation Area. We expect that any San Joaquin kit foxes within 200 feet of any portion of the FCMS undergoing construction activities will be harassed. Disturbance to San Joaquin kit foxes generated by use of construction equipment and construction activities is expected to be minimal and temporary because the proposed habitat restoration will occur over a short duration (less than 3 months) during the summer months, and there is alternative habitat available for use and movement by the San Joaquin kit fox within and around the FCMS. The FRA and the Authority has proposed conservation measures, such as use of Service-approved biological monitors, enforcement of speed-limits, and daily inspections of construction areas, to avoid injury and mortality of San Joaquin kit fox. Wildlife exclusion fencing is not proposed to be erected within the FCMS during project implementation. San Joaquin kit foxes are known to den in friable disturbed soils within construction areas. Construction activities are expected to occur outside of the breeding and pupping season; therefore, Service-approved protocols for excluding San Joaquin kit foxes from dens will be implemented per proposed conservation measures for this species. The behavior of any individuals attempting to den in the FCMS construction area will be altered by any den exclusions, but injury is not expected to occur.

The FCMS will provide 365.7 acres of highly suitable habitat to support breeding, foraging, and denning for the San Joaquin kit fox, and will be protected and managed for the conservation of this species in perpetuity (Table 6).

Effects associated with operation activities

Movement and connectivity

According to the data provided from Wilbert and Maldonado's studies (pers. comm., 2012), the genetically defined San Joaquin kit fox populations within and around the project action area currently fit well within the parameters of recommendations of Mills et al (1996) for minimizing the rate of loss of genetic diversity. Under a metapopulation model, several genetically distinct populations with moderate migration among them is nearly an ideal situation for maintaining overall high levels of genetic diversity and minimizing adverse effects of demographic stochasticity, which is fundamental to the conservation of any species (Allendorf and Luikart 2007; Mills 2007). Maintaining these current levels of connectivity is crucial for the long-term survival and recovery of the San Joaquin kit fox.

Therefore, the FRA and the Authority has proposed construction of 73 to 98 dedicated wildlife crossings to ensure connectivity for the San Joaquin kit fox within areas identified as movement corridors and linkages to core recovery areas. Elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and large drainage structures (e.g., large-diameter culverts 60 to 120 inches in diameter and 60 feet long) may also facilitate movement of San Joaquin kit foxes. Dedicated wildlife crossings, as proposed in the project description for the San Joaquin kit fox will be spaced at approximately 0.3-mile intervals as appropriate within the core, linkage, and satellite areas identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998).

The spacing and location of dedicated wildlife crossings for the Fresno to Bakersfield Section was based on (1) existing land uses; (2) existing and proposed infrastructure not associated with the CHST-FB Project; (3) previously identified wildlife movement corridors; (4) consistency with the *Recovery Plan for Upland Species of the San Joaquin* Valley, *California* (Service 1998); and (5) comments provided by Cypher (in litt. 2010, 2011, and 2013; and pers. comm., 2012 and 2013). The highest density of dedicated wildlife crossing structures is proposed for the section of the alignment between Cross Creek in Kings County and Poso Creek in Kern County. Within this region, dedicated wildlife crossing structures will be spaced at approximately 0.3-mile intervals. This area passes adjacent to the AER and the PNWR, which contain important habitat for San Joaquin kit fox, as well as several other federally listed species. Other wildlife crossing opportunities in areas where adjacent land uses are relatively conducive to wildlife movement (e.g., grazing land, grain, orchards, hay, and idle pasture) may be provided by bridges, large drainage culverts, and road crossings (60 inches in diameter and 60 feet long; OF = 0.33). For example, dedicated wildlife crossings are not proposed to be constructed within the 5 to 6-mile wide linkage area near Poso Creek that intersects with the HST; however, three of the large drainage culverts are proposed for the BNSF alternative, and a portion of the Wasco-Shafter alternative will be constructed as elevated track within this area. These proposed culvert structures and portions of elevated track may provide opportunity for movement of San Joaquin kit fox within this linkage area (Cypher, in litt, 2013; and pers. comm., 2013).

Crossing opportunities for the San Joaquin kit fox south of the Poso Creek linkage area down into urban Bakersfield will consist of up to 9 road overcrossings within this 18 to 20-mile portion of the alignment. About 27 to 40 small drainage culverts (30 inches in diameter and 60 feet long) are also proposed to be constructed within this portion of the alignment. It is unlikely that San Joaquin kit fox will use these structures for crossing under the HST because the very small OF (0.08) (Cypher in litt. 2010, 2011; Cypher, pers. comm., 2012 and 2013). However, this stretch of the alignment consists of dense agricultural development and San Joaquin kit fox have not been documented to use this area for movement (Cypher in litt. 2010, 2011; Cypher, pers. comm., 2012 and 2013).

Existing highways, roads, the BNSF rail line, urban development, and incompatible agricultural land uses may restrict movement of individuals and connectivity among existing San Joaquin kit fox populations (Service 2010; Spencer et al. 2010). Greater than 79 percent of the CHST-FB Project (~82 miles) will be installed at-grade. Portions of at-grade tracks will occur through areas that currently facilitate connectivity. Security fencing will be installed wherever the tracks are at-grade. Without the incorporation of wildlife crossing structures into the project design, the installation of long expanses of at-grade tracks with security fencing could potentially result in further loss and fragmentation of habitat and severely limit connectivity among San Joaquin kit fox habitats and populations, and preclude recolonization of currently unoccupied historic habitat. Therefore, the proposed wildlife crossings are crucial for maintaining connectivity among existing San Joaquin kit fox populations within and around the project action area.

The proposed design for the wildlife crossing is based on studies of use of highway undercrossings by San Joaquin kit fox, and other medium-sized mammals, such as the swift fox. Studies sponsored by the California Department of Transportation on highway undercrossings offered some insight into a minimum OF, as defined in the Project Description, for San Joaquin kit foxes, but the results of these studies were not conclusive (Bremner-Harrison et al. 2007). In one study, use of crossing structures under four-lane divided highways by San Joaquin kit foxes was examined at three study sites: one each along Interstate 5, SR 58, and SR 14. San Joaquin kit foxes were confirmed to be present at all three sites (Bremner-Harrison et al. 2007). A total of 45 undercrossing structures were monitored at the three separate sites. OFs ranged from 0.001 to 5.70, with most values estimated at the lower end of this range. Although San Joaquin kit foxes explored the entrances to some of these structures, no evidence was found of foxes crossing completely through any of the structures. However, evidence that San Joaquin kit foxes preferred the use of road overcrossings at all three study sites was incidentally discovered during the study.

In another study, use of crossing structures by swift foxes (*Vulpes velox*) was examined along four-lane divided highways in Colorado and South Dakota (Clevenger et al. 2010). At the Colorado site, 24 structures were monitored. Swift foxes were detected completely crossing through several 213-foot long culverts with OFs ranging from 0.12 to 0.45. At the South Dakota site, 49 structures were monitored. Swift foxes were detected completely crossing through six structures, all of which were round culvert designs with OFs ranging from 0.23 to 0.81.

Arizona Game and Fish Department (AGFD) guidelines for crossing structures recommend a minimum OF of 0.4 for medium-sized mammals, including foxes (AGFD 2006). The AGFD guidelines also recommend spacing wildlife crossings every 500 to 1,000 feet in areas designated as movement corridors for medium-sized mammals when the expanse of a road or highway will exceed at least one-half mile. An opening of at least 30-square feet (3 feet x 10 feet) was recommended for wildlife crossings that will have a length of 75 feet (AGFD 2006).

The proposed design for all wildlife-designated crossing structures for the HST is based on consultation with Dr. Brian, a species expert. His guidance is based his guidance on the findings of the swift fox study by the Clevenger et al. (2010) study and AGFG recommendations (Cypher pers. comm., 2010). The proposed structures will consist of box culverts and short-span slab bridges (constructed for tracks to cross over hydraulic features), and will be located below the HST tracks. The proposed crossing structures will provide a minimum opening that is 3 feet high, 10 feet wide, and 73 feet long (OF = 0.41). The invert or bottom of the structure opening may extend below the existing grade to accommodate variations in the topography. However, all wildlife crossings will have at least 50 percent of the vertical clearance above grade of the approaches to the opening. This will allow San Joaquin kit foxes entering the crossing to see through to the opening at the opposite end of the structure.

Other structures that will be constructed for the Fresno to Bakersfield alignment, such as road overcrossings, spans, and bridges, may provide opportunities for movement of San Joaquin kit fox. The Fresno to Bakersfield alignment will include 172 to 197 road overcrossings to accommodate existing two-lane roads that will intersect with the HST. These road overcrossings provide opportunities for a variety of terrestrial wildlife species to cross over the alignment, especially after nightfall when traffic subsides and, on roads with low traffic volume. San Joaquin kit fox have been documented to use road overcrossings to gain access across highways (Bremner-Harrison et al. 2007; Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012). Therefore, the proposed road overcrossings will provide numerous opportunities for movement of San Joaquin kit fox across the HST (Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012).

Several large bridges and elevated spans that will be constructed across rivers, creeks, and other aquatic or land features may also provide opportunities for movement of San Joaquin kit fox (Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012). About 18 to 24 bridge structures of various sizes are proposed for construction of the CHST-FB Project. In addition, approximately 22 to 33 linear miles of elevated track is proposed for the Fresno to Bakersfield alignment, which will allow for unrestricted movement of San Joaquin kit fox in those areas.

Exposure to predators and infectious diseases

The wildlife crossings may be used by other motile species such as coyotes, bobcats, feral cats and stray dogs to gain access across the HST tracks. Therefore, it may be likely that San Joaquin kit foxes may experience increased encounters with potential predators when using the proposed crossing structures. There may be potential for mortality if San Joaquin kit fox encounter predators while traveling parallel to the rail line in search of a crossing opportunity. However,

artificial escape dens will be installed within the crossing structures that will provide temporary escape. The artificial escape dens will consist of four sections of corrugated metal pipe, 20 feet long and 10 inches in diameter, will be anchored at each crossing structure. The openings of both ends of all artificial escape dens will be narrowed to a 4 to 6 inch diameter. San Joaquin kit foxes may find temporary refuge opportunities within the artificial escape dens in the event they encounter a larger predator. The FRA and the Authority has proposed to construct 73 to 98 dedicated wildlife crossings at 0.3-mile intervals, which should provide numerous opportunities for San Joaquin kit fox to gain access across the HST while minimizing the risk of encountering predators. Therefore, the potential for encounters with predators within and around wildlife crossings will be minimized through installation of the proposed wildlife crossings and artificial escape dens, and mortality from predation is not expected to occur within these structures.

The installation of the proposed wildlife crossing structures and escape dens, as described above, will also provide refuge that will allow San Joaquin kit fox to minimize or avoid contact with animals carrying transmissible infectious diseases when using the crossing structures. Increased interface between rural areas, agricultural lands and urban development may result in higher densities of wild and domestic species that benefit from human activities in these areas (Bradley and Altizer 2006). Raccoons, coyotes, skunks, red foxes, gray foxes, feral cats, and stray dogs may occur at higher densities than San Joaquin kit fox within and around the project action area where an interface between agricultural lands and urban development exists within and around the cities of Fresno and Bakersfield (Cypher et al. 2005; Smith et al. 2006; Service 2010a). These animals, especially raccoons and other small species may use the proposed crossing structures. For example, raccoons were detected at highway undercrossings in southern California more frequently than any other wild mammal species (Ng et al. 2004). Skunks, cats, and dogs were also detected using these undercrossings (Ng et al. 2004). These wild and domestic animals may carry transmissible infectious diseases, such as rabies, canine distemper virus, sarcoptic mange, and canine parvovirus (Cypher et al. 1998; Burton and Doblar 2004; Riley et al. 2004; Cummings et al. 2009). The proposed number of crossing structures and spacing intervals will provide sufficient opportunities for movement of San Joaquin kit foxes across the HST and minimize the probability of exposure to infected animals.

Exposure to increased noise levels

San Joaquin kit fox currently experience noise disturbance from highway, railroad, and road traffic. In addition to noise generated by highway and road traffic, San Joaquin kit fox that reside in metropolitan Bakersfield experience noise disturbance from a wide range of sources such as construction and human disturbance. The operation of the CHST-FB may result in additional noise disturbance that may temporarily impair behavioral patterns of this species and their prey. According to the proposed schedule for train operations, northbound and southbound trains will travel at least two to three times per hour from 6:00 a.m. to 12:00 a.m. However, noise disturbance from operation of the HST will not occur during nocturnal activities of San Joaquin kit fox in areas adjacent to the alignment from 12:00 a.m. through 6:00 a.m. (~ 6 hours).

The FRA has established noise exposure limits for all wildlife at a sound exposure level (SEL) of 100 dBA from passing trains. Construction equipment, such as bulldozers, may produce noise in

the range of 85 dBA (Burgland and Lindvall 1995). Assuming no intervening structures and maximum speeds of 220 mph, the FRA and the Authority has estimated that 100 dBA SEL will occur within 100 feet from the trackway centerline for at-grade alignments, and estimated 15 feet from the centerline for elevated sections on structures. This noise level is comparable to a helicopter operating at the same distance (Service 2006b). The FRA and the Authority has estimated that the 100 dBA SEL will be exceeded consistently throughout all alternatives for an estimated 100 feet from the trackway centerline for at-grade alignments.

All areas of the HST that are at-grade within suitable habitat are expected to experience increased noise exposure that may exceed the 100 dBA SEL threshold and potentially elicit a temporary startle, avoidance or negative behavior from San Joaquin kit fox and their prey. However, San Joaquin kit fox studied in Bakersfield, which appear to have adapted to the urban environment, have been observed denning near major roads (Bjurlin et al. 2005). Several San Joaquin kit fox were also observed using culverts and other road structures as dens in this same study (Bjurlin et al. 2005). Therefore, it is likely that San Joaquin kit fox will become quickly adapted to the increased noise disturbance generated by operation of the HST.

Conservation measures for the San Joaquin kit fox

The FRA and the Authority has proposed to mitigate for the final calculated permanent habitat loss for the San Joaquin kit fox. This will be accomplished through the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the San Joaquin kit fox in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. As described in the FRA and Authority-prepared Compensatory Mitigation Plan, implementation of the mitigation proposal will preserve natural habitat for the San Joaquin kit fox within core, linkage, and satellite areas identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998). The proposed permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012), which support potential foraging and dispersal habitat for this species, are located within these core, linkage, and satellite areas.

Tipton kangaroo rat

Effects associated with construction activities

Mortality, injury, or harassment of Tipton kangaroo rats could occur from being crushed by project related equipment or vehicles, or construction debris within the action area during construction activities. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Tipton kangaroo rats could fall into trenches, pits, or other excavations, and may be directly killed or unable to escape and be subjected to desiccation, entombment, or starvation. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. However, implementation of conservation measures proposed specifically for the Tipton kangaroo rat, such as minimizing the total area disturbed by project activities, conducting pre-construction surveys, and inspecting burrows to make sure individuals are not inadvertently

crushed, providing escape ramps in trenches, and wildlife exclusion fencing will minimize mortality, injury, or harassment.

Construction of the CHST-FB Project will result in the permanent loss of between 367.18 and 453.85 acres of potential habitat for the Tipton kangaroo rat (Table 5). At the time of listing, habitat loss associated with agricultural development was identified as the main factor contributing to the decline of the Tipton kangaroo rat (Service 1988). The *Recovery Plan for Upland Species of the San Joaquin Valley, California* also cited habitat loss as the main reason for the decline for the Tipton kangaroo rat (Service 1998). In addition, the Tipton kangaroo rat is threatened by further habitat loss and fragmentation as a result of infrastructure development (Service 2010b). Between 1997 and 2010, the total of permanent loss of habitat was estimated to be about 14,824 acres (Service 2010b).

As of 2010, the total acreage of lands protected for the Tipton kangaroo rat under conservation easements was estimated to be about 40,700 acres (Service 2010b). Approximately 37 percent of these lands occur within and around the project action area. The PNWR (~ 10,300 acres), managed by the Service, has several small patches of high quality habitat (alkaline plains sparsely covered with annual grasses and saltbush) that could support Tipton kangaroo rat (Service 2010b). The AER (~ 4,936 acres), managed by the CDFW, contains high quality habitat that could support the Tipton kangaroo rat as well (Service 2010b). The CHST-FB Project may cross the AER, depending on the alternative that is finally selected, which could result in loss of habitat for this species within AER, decreased carrying capacity of habitat patches, and potentially subdivide existing populations.

In the event that Tipton kangaroo rats are discovered within the project action area during pre-construction surveys or become accidently trapped within the project action area, the FRA and the Authority will immediately contact the Service. The FRA and the Authority has agreed to prepare and implement a Service-approved small mammal trapping and relocation plan in general accordance with the survey protocols in the *California Valley Solar Ranch Project: Plan for Relocation of Giant Kangaroo Rats*. Tipton kangaroo rats may become disorientated after translocation, which can result in drastically increased vulnerability to mortality as a result of predation and competition with cohorts for resources (Germano 2010). However, implementation of Service-approved relocation plan will minimize effects of disorientation and the risk of mortality from translocation. In addition, translocation of Tipton kangaroo rats under a Service-approved relocation plan will minimize the risk of mortality as a result of construction activities and assist in expanding existing populations into unoccupied habitat.

Effects associated with operation activities

Operation of the Fresno to Bakersfield Section may result in injury or mortality to Tipton kangaroo rats within the right-of-way. Security fencing along at-grade tracks will prohibit Tipton kangaroo rats from accessing the right-of-way and at-grade tracks or track ballast. Dedicated wildlife crossings structures specifically designated for use by this species have not been proposed for the CHST-FB Project. However, Tipton kangaroo rats may gain access across the

alignment through any dedicated wildlife crossings intended for San Joaquin kit fox, drainage culverts, or small bridges that may be coincidentally located within their habitat.

There is a high density of dedicated wildlife crossings, small drainage culverts, several bridges, and about 5 to 6 miles of elevated track proposed for the section of the FB HST alignment where this species is most likely to occur. If these structures are located in sections of the HST that intersect with populations of Tipton kangaroo rats they could potentially maintain connectivity for this species. However, the status of the Tipton kangaroo rat within the project action area is not known at this time. Therefore, it is difficult determine whether these proposed structures will be located in areas that will facilitate movement and maintain connectivity for this species.

If crossing opportunities are inadequate, movement of Tipton kangaroo rat within the project action area may be permanently altered as a result of the construction of at-grade tracks with security fencing in areas where installation of potential crossing structures are not proposed. This may also result in the permanent subdivision of Tipton kangaroo rat populations, fragmentation of habitat, and preclude recolonization of currently unoccupied historic habitat. Loss of connectivity among Tipton kangaroo rat populations among habitats surrounding the project action area may result in increased demographic stochasticity, genetic isolation and inbreeding (Gilpin and Soulé 1986; Soule and Mills 1998; Mills 2007). Restricted movement of Tipton kangaroo rat may limit or entirely prohibit access to suitable habitat, resources, and mates on either side of the HST track.

Exposure to increased noise levels

The operation of the Fresno to Bakersfield Section may result in additional noise disturbance that may temporarily impair behavioral patterns of this species. According to the proposed schedule for train operations, northbound and southbound trains will travel at least two to three times per hour from 6:00 a.m. to 12:00 a.m. However, noise disturbance from operation of the HST will not occur during nocturnal activities of Tipton kangaroo rats in areas adjacent to the alignment from 12:00 am through 6:00 a.m. (~ 6 hours).

The FRA has established noise exposure limits for all wildlife at a sound exposure level (SEL) of 100 dBA from passing trains. Construction equipment, such as bulldozers, may produce noise in the range of 85 dBA (Burgland and Lindvall 1995). Assuming no intervening structures and maximum speeds of 220 mph, the FRA and the Authority has estimated that 100 dBA SEL will occur within 100 feet from the trackway centerline for at-grade alignments, and estimated 15 feet from the centerline for elevated sections on structures. This noise level is comparable to a helicopter operating at the same distance (Service 2006b). According to the FRA and the Authority, it is expected that the 100 dBA SEL will be exceeded consistently throughout all alternatives within 100 feet of the trackway centerline for at-grade alignments.

Non-auditory communication is important for many mammalian species. Some mammals use vibration by drumming feet, teeth or heads or stamping feet to denote territorial advertisement, agonistic interactions, co-coordinate mating interactions, sub-ordinance and unwillingness to interact, and alert their cohorts to potential danger (Randall and Lewis 1997; Randall 1997;

Randall, 2001.) *Dipodomys* species, such as the Tipton kangaroo rat, are known to use footdrumming as a means of communication and attracting mates (Randall and Lewis 1997; Randall 1997; Randall 2001). These species are also known to have highly-developed auditory senses capable of detecting low-frequency sound. The temporal bone of the kangaroo rat, which is characterized by an enlarged middle ear known as the auditory bulla, is commonly believed to be responsible for the improved low-frequency sensitivity (Shaffer and Long 2004). The Tipton kangaroo rat species are known to have enlarged auditory bulla relative to their small size.

All areas of the HST that are at-grade within suitable habitat are expected to experience increased noise exposure that may exceed the 100 dBA SEL threshold and potentially elicit a temporary startle, avoidance or negative behavior from Tipton kangaroo rats. The increased noise exposure may also interfere with communication and disrupt mating behavior (footdrumming) for this species. Tipton kangaroo rats may vacate habitats located adjacent to the HST in response to the increased exposure to noise and vibration resulting from operation of the HST or, this species may also become adapted to the increased noise exposure and vibration over time. However, there is insufficient information regarding the specific response of Tipton kangaroo rats to exposure to increased noise disturbance and vibration available to the Service at this time. Therefore, it is difficult to anticipate the response of this species and potential for disruption of its natural behaviors such as feeding, breeding, burrowing, and communication among cohorts.

Conservation measures for the Tipton kangaroo rat

Implementation of the proposed conservation measures will significantly reduce adverse effects to Tipton kangaroo rats during project construction, maintenance, and operational activities. However, some mortality of Tipton kangaroo rats may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe. The CHST-FB Project will result in the permanent loss of up to 453.58 acres of habitat for the Tipton kangaroo rat (Table 5). The FRA and the Authority has proposed to mitigate for the final calculated permanent habitat loss for Tipton kangaroo rat though the acquisition of permittee-responsible mitigation sites within Fresno, Tulare, Kings, and Kern counties that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the Tipton kangaroo rat and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Several permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012) support habitat with documented occurrences of this species are proposed.

Central California tiger salamander

Effects associated with construction activities

Mortality, injury, or harassment of central California tiger salamanders may occur from being crushed by project related equipment or vehicles, or construction debris within the action area during construction activities. These small, cryptic animals are at risk from being crushed by project related equipment or vehicles, or construction debris within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental

conditions. Central California tiger salamanders could fall into trenches, pits, or other excavations, and may be directly killed or unable to escape and be subjected to desiccation, entombment, or starvation. Disturbance from construction activities may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. However, implementation of conservation measures proposed specifically for the central California tiger salamander, such as minimizing the total area disturbed by project activities, conducting pre-construction surveys, and inspecting burrows to make sure individuals are not inadvertently crushed, providing escape ramps in trenches, and wildlife exclusion fencing will minimize mortality, injury, or harassment. Up to 18.7 acres of upland habitat and 18.3 acres of aquatic habitat for the central California tiger salamander will be permanently lost as a result of construction of the CHST-FB Project.

In the event that central California tiger salamanders are discovered during pre-construction surveys or become accidently trapped within the project action area, the FRA and the Authority will immediately contact the Service. Capture and relocation of central California tiger salamanders is not currently proposed or authorized as a conservation measure for this project.

FCMS: Construction Activities for Habitat Restoration:

Construction activities associated with the proposed wetland and riparian restoration will occur within the 405-acre FCMS. Construction activities will occur over a short duration (less than 3 months) during the dry season. Disturbance to upland habitat during construction activities is expected to be minimal within the Vernal Pool Preservation Area because established routes for movement of equipment will be designated and monitored by the Service-approved biologist. Pre-construction surveys for potentially occupied burrows may be used to designate areas to be avoided by construction equipment and workers. However, some central California tiger salamanders that were not detected while inhabiting burrows during preconstruction surveys may suffer injury or mortality if the burrows are crushed by construction equipment. The FRA and the Authority are proposing to develop a plan for relocating central California tiger salamanders from burrows within work areas to burrows in upland habitat that will not be disturbed by construction activities. The relocation plan will be submitted to the Service for review and approval prior to implementation. It is reasonably likely that Central California tiger salamanders will be subject to harassment during the relocation.

Effects to the central California tiger salamander resulting from disturbance generated by use of construction equipment and construction activities are expected to be minimal and temporary because the proposed habitat restoration will occur over a short duration (less than 3 months) during the summer months, and there is sufficient alternative habitat available for use and movement by the this species within the FCMS.

The FRA and the Authority has proposed conservation measures, such as use of Service-approved biological monitors and daily inspections of construction areas to avoid injury and mortality of central California tiger salamander. The FCMS will provide 7.6 acres of preserved vernal habitat, 10 acres of vernal pool restoration, and 365.7 acres of upland habitat to support

breeding, foraging, and sheltering for the central California tiger salamander, and will be protected and managed for the conservation of this species in perpetuity.

Effects associated with operation activities

Operation of the Fresno to Bakersfield Section may result in injury or mortality to central California tiger salamanders within the right-of-way. Security fencing along at-grade tracks will prohibit central California tiger salamanders from accessing the right-of-way and at-grade tracks or track ballast. Dedicated wildlife crossings structures specifically designated for use by this species have not been proposed for the CHST-FB Project. However, central California tiger salamanders may gain access under the alignment through any dedicated wildlife crossings intended for San Joaquin kit fox, drainage culverts, or small bridges that may be coincidentally located within their habitat.

Movement of central California tiger salamanders within the project action area may be permanently altered as a result of the construction of at-grade tracks with security fencing in areas where installation of potential crossing structures are not proposed. This may also result in the permanent subdivision of central California tiger salamander populations, fragmentation of habitat, and preclude recolonization of currently unoccupied historic habitat.

Implementation of the proposed conservation measures will significantly reduce adverse effects to central California tiger salamanders during project construction, maintenance, and operational activities. However, some mortality of central California tiger salamanders may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe.

Conservation measures for the central California tiger salamander

Implementation of the proposed conservation measures will significantly reduce adverse effects to Central California tiger salamanders during project construction, maintenance, and operational activities. However, some mortality of central California tiger salamanders may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe.

The CHST-FB Project will result in the permanent loss of up to 18.7 acres of upland habitat and 18.3 acres of aquatic habitat for the central California tiger salamander (Table 5). The FRA and the Authority has proposed to mitigate for the final calculated permanent habitat loss for central California tiger salamander through the purchase of mitigation credits at an approved conservation bank or the acquisition of permittee-responsible mitigation sites within Fresno, Tulare, Kings, and Kern counties that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the central California tiger salamander and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. The proposed permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012) may support suitable breeding and aestivation habitat with documented occurrences of this species in all of its life stages.

Blunt-nosed leopard lizard

Effects associated with construction activities

Mortality, injury, or harassment of blunt-nosed leopard lizards may occur from being crushed by project related equipment or vehicles, or construction debris within the action area during construction activities. These small animals are at risk from being crushed by project related equipment or vehicles, or construction debris within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Blunt-nosed leopard lizards could fall into trenches, pits, or other excavations, and may be directly killed or unable to escape and be subjected to desiccation, entombment, or starvation. Disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. However, implementation of conservation measures proposed specifically for the blunt-nosed leopard lizard, such as minimizing the total area disturbed by project activities, conducting pre-construction surveys, daily clearance surveys, and inspecting burrows to make sure individuals are not inadvertently crushed, providing escape ramps in trenches, and wildlife exclusion fencing will minimize mortality, injury, or harassment.

Access to suitable habitat such as alkali desert scrub, annual grasslands, and barren habitats will become restricted or permanently lost due to permanent structures associated with the CHST-FB Project. Movement of blunt-nosed leopard lizards within the project action may be altered as a result of these effects.

Effects associated with operation activities

Operation of the Fresno to Bakersfield Section may result in injury or mortality to blunt-nosed leopard lizards within the right-of-way. However, security fencing along at-grade tracks will prohibit blunt-nosed leopard lizards from accessing the right-of-way and at-grade tracks or track ballast. Dedicated wildlife crossings structures specifically designated for use by this species have not been proposed for the CHST-FB Project. However, blunt-nosed leopard lizards may gain access across the alignment through any dedicated wildlife crossings intended for San Joaquin kit fox, drainage culverts, or small bridges that may happen to be constructed within their habitat.

Movement of blunt-nosed leopard lizards within the project action area may be permanently altered as a result of the construction of at-grade tracks with security fencing in areas where installation of potential crossing structures are not proposed. This may also result in the permanent subdivision of blunt-nosed leopard lizard populations, fragmentation of habitat, and preclude recolonization of currently unoccupied historic habitat. Loss of connectivity among blunt-nosed leopard lizard populations among habitats surrounding the project action area may result in increased demographic stochasticity, genetic isolation and inbreeding (Gilpin and Soulé 1986; Soule and Mills 1998; Mills 2007). Restricted movement of blunt-nosed leopard lizards may limit or entirely prohibit access to suitable habitat, resources, and mates on either side of the HST track. Mortality of blunt-nosed leopard lizards may occur because the species may be

difficult for operators of maintenance equipment and vehicles to observe. However, implementation of the proposed conservation measures will significantly reduce adverse effects, including mortality, to blunt-nosed leopard lizards during project construction, maintenance, and operational activities.

Conservation measures for the blunt-nosed leopard lizard

Implementation of the proposed conservation measures will significantly reduce adverse effects to blunt-nosed leopard lizards during project construction, maintenance, and operational activities. However, some mortality of blunt-nosed leopard lizards may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe. The CHST-FB Project will result in the permanent loss of up to 98.06 acres of suitable habitat for the blunt-nosed leopard lizards (Table 5). The FRA and the Authority has proposed to mitigate for the final calculated permanent habitat loss for blunt-nosed leopard lizard through the acquisition of permittee-responsible mitigation sites within Fresno, Tulare, Kings, and Kern counties that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the blunt-nosed leopard lizard and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Several permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012) support habitat with documented occurrences of this species are proposed.

Vernal pool habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp

For the purposes of the impact assessment for vernal pool habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp, the FRA and the Authority has considered that permanent effects will occur as a result of excavation or fill to vernal pool habitat within the footprint of the HST, and any vernal pool habitat within 250 feet of the footprint. Adverse effects from HST construction and operation activities will be caused by erosion, soil compaction, increased siltation/sedimentation, fractures in the hardpan soils, destruction of native vegetation, and significant alteration of hydrology for vernal pools or seasonal wetlands that provide habitat for vernal pool species. The hydrology of vernal pools may be altered from the loss of a watershed, up-slope destruction of the water restricting layer, and changes in surface topography. Published scientific works conducted in vernal pool complexes have shown that vernal pools depend not just on rain falling into the pool basin and water flowing overland, but also water flowing below the soil surface (Rains et al. 2006; Rains et al. 2008; Williamson et al. 2005). The proposed project may result in up-slope and or down-slope destruction of the water restricting soil layers and changes in surface topography. When functioning properly, this perched groundwater system flows from the upland landscape to vernal pools and stabilizes vernal pool water levels, causing them to be inundated over larger areas for longer period of time than will be the case if they were recharged only by precipitation (Rains et al. 2006). This subsurface flow occurs on top of the claypan or hardpan that equipment has been perforated or excavated. Excavation of areas with higher elevation inter-mound areas or hardpan perforation in lower areas effectively serves to drain this water from the soil before it enters the vernal pools. Therefore, alteration of the

hydrology of vernal pool habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp are reasonably likely to occur as a result of the proposed project.

Further effects to vernal pool habitat include the introduction or further spread of invasive plant species that could potentially affect pool hydrology, and long-term degradation of both vernal pool and upland plant communities. It may be difficult to limit the spread of existing non-native plant species within vernal pool habitat during construction activities. Some invasive species may inadvertently be introduced through seeds carried on workers clothing and footwear. However, the introduction of plant species into vernal pool and wetland habitat by construction equipment and vehicles will be limited, to the maximum extent feasible, through implementation of the WCP. All disturbed areas of upland habitat will be restored and revegetated with native plants and seeds following construction under the guidance of the RRP. Construction vehicles and equipment will be limited to existing roads and other developed areas within the construction footprint.

The implementation of BMPs and the Stormwater Pollution Prevention Plan will avoid adverse effects from fuel or chemical spills, sedimentation, erosion, hydromodification and runoff from construction areas into vernal pool and wetland habitat for the vernal pool species. Therefore, adverse effects to vernal pool habitat from spills, sedimentation, and runoff are not expected to occur.

Effects associated with construction and operation activities

Vernal pool habitat occurs within the project action area that may be suitable for vernal pool fairy shrimp and vernal pool tadpole shrimp. The Service anticipates that direct and indirect effects to these species will occur in areas where vernal pool habitat is identified within the project action area. Effects to each of these listed branchiopod species was calculated by summing the acreage of potentially suitable vernal pool habitats within the project action area, and linking these habitats to CNDDB records for each species within specific USGS 7.5-minute quadrangles as they occur within the Fresno to Bakersfield Section of the HST. The construction and operation of the Fresno to Bakersfield Section may result in direct effects on populations of vernal pool fairy shrimp and vernal pool tadpole shrimp through degradation or loss of seasonally inundated depressions such as vernal pools that support the reproductive cycle of these species. Direct adverse effects, such as harm or mortality from heavy equipment, may also occur during construction of the CHST-FB Project. Construction of the CHST-FB Project may result in disruption of upland areas surrounding vernal pool branchiopod habitat that will alter water retention and flow within the landscape and influence the timing and intensity of inundation necessary to support the life cycle of these species.

Conservation measures for the vernal pool fairy shrimp and the vernal pool tadpole shrimp

Implementation of the proposed conservation measures, such as installation of exclusion fencing around vernal pool habitat, and use of erosion control materials, will reduce adverse effects to the vernal pool fairy shrimp and the vernal pool tadpole shrimp during project construction, maintenance, and operations. It is expected that all vernal pool and wetland habitat for the vernal

pool fairy shrimp and the vernal pool tadpole shrimp within the project footprint and 250 feet of the footprint will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST. Up to 29.77 acres of suitable vernal pool habitat for the vernal pool fairy shrimp and.0041 acre for the vernal pool tadpole shrimp may be permanently lost as a result of the proposed CHST-FB Project (Table 5). The FRA and the Authority has proposed to mitigate for the final calculated permanent habitat loss resulting from direct effects to vernal pool habitat within the project footprint and indirect effects to vernal pool habitat within 250-feet of the project footprint for the vernal pool fairy shrimp and the vernal pool tadpole shrimp through acquisition of permittee-responsible mitigation sites within Fresno, Tulare, Kings, and Kern counties that will be protected in perpetuity through conservation easements and/or through purchase of credits at a Service-approved conservation banks. These lands will be protected and managed for the conservation of the vernal pool fairy shrimp and the vernal pool tadpole shrimp and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Valley elderberry longhorn beetle

Up to 36 elderberry shrubs are estimated to potentially occur within the project action area. All elderberry shrubs within the project action area may be lost and will be subject to Service transplantation guidelines *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Service 1999a) (Table 7). Surveys for the valley elderberry longhorn beetle and suitable habitat for this species have not been completed throughout most of the project action area because of limited access.

Effects associated with construction and operation activities

Negative effects to elderberry shrubs may directly affect the survival of valley elderberry longhorn beetle because they are host-specific to this plant species. Valley elderberry longhorn beetle populations may be temporarily affected, both directly and indirectly, by construction, maintenance, and operational activities within the project action area. Construction, maintenance, and operational activities may result in direct effects on valley elderberry longhorn beetle through the removal or partial destruction of elderberry shrubs within the project action area. Valley elderberry longhorn beetle mortality may occur from collisions or crushing by vehicles, equipment, human destruction or disturbance of occupied elderberry shrubs, or destruction of native riparian habitat. The construction footprint and areas extending up to 100 feet from the edge of the project footprint have the potential to directly and indirectly affect elderberry shrubs and thus potential habitat for valley elderberry longhorn beetle. However, the extent of effects to valley elderberry longhorn beetle will be determined through the number of elderberry shrubs and stems that will actually be directly or indirectly affected.

Conservation measures for the valley elderberry longhorn beetle

Implementation of the proposed conservation measures will significantly reduce adverse effects to the valley elderberry longhorn beetle during project construction, maintenance, and operations. The FRA and the Authority will follow compensatory mitigation measures provided within the

Conservation Guidelines for the Valley Elderberry Longhorn Beetle (Table 7) (Service 1999a). The Authority has proposed to implement compensatory mitigation for this species at several permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012). These sites, located within Fresno, Tulare, Kings, and Kern counties, will be acquired, protected in perpetuity through conservation easements, protected and managed for the conservation of valley elderberry longhorn beetle, and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Implementation of these mitigation measures and proposed revegetation of disturbed areas will enhance and protect habitat that will support the survival and recovery of the valley elderberry longhorn beetle.

Table 7. Summary of proposed compensation for permenant effects to suitable habitat for the Valley elderberry longhorn beetle.[a]

Stem Size Class (maximum diameter at ground level, in inches)	Exit Holes on Shrub [b]	Elderberry Seedling/ Cutting Ratio [c]	Associated Native Plant Ratio [d]
Riparian Habitat			
Stems 1 to 3	Yes	1:1	1:1
	No	2:1	2:1
Stems 3 to 5	Yes	2:1	1:1
	No	4:1	2:1
Stems > 5	Yes	3:1	1:1
	No	6:1	2:1
Non-Riparian Habitat			
Stems 1 to 3	Yes	2:1	1:1
	No	4:1	2:1
Stems 3 to 5	Yes	3:1	1:1
	No	6:1	2:1
Stems > 5	Yes	4:1	1:1
	No	8:1	2:1

[a] Compensation was determined following the guidelines in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Service 1999a).

[b] All stems measuring at least 1 inch in diameter at ground level on a single shrub are considered occupied when exit holes are present anywhere on the shrub.

[c] Ratios in the *Elderberry Seedling Ratio* column correspond to the number of cuttings or seedlings to be planted per elderberry stem (at least 1 inch in diameter at ground level) affected by the proposed project.

[d] Ratios in the *Associated Native Plant Ratio* column correspond to the number of associated native species to be planted per elderberry (seedling or cutting) planted.

California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads

Direct and indirect effects to California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads will be presumed where suitable habitat occurs within the project action area. Effects to each of these listed plant species were calculated by summing the acreage of potentially suitable habitats within the project footprint that occur within the range of each species. The proposed project will result in the permanent loss of potentially suitable habitat for

for the California jewelflower (up to 15 acres), the Hoover's spurge (up to 6.35 acres), the Kern mallow (up to 214 acres), and the San Joaquin woolly-threads (up to 489.34 acres) (Table 5).

Effects associated with construction activities

Construction of the Fresno to Bakersfield Section may result in adverse effects to small, isolated populations of California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads that occur within the project footprint. Suitable habitat for these plants within the project action area will be permanently affected through the spread of non-native invasive plant species introduced as seeds and propagules. The introduction and/or spread of non-native plants increase competition for resources (i.e., sun, water, soil nutrients), which may negatively affect flowering success, pollination, seeding, and germination (Gerhardt and Collinge 2003). The introduction of non-native plant species may also significantly alter habitat heterogeneity by out-competing native plants, thereby further facilitating successful invasion of the non-natives. Successful invasion of non-native plant species could result in permanent degradation of suitable habitat for the California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads and negatively affect the fitness of populations that occur within the project footprint.

Effects associated with operation and maintenance activities

In some areas, where the track is at-grade and drainage swales will be constructed, suitable habitat for California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads may occur within the operational right-of-way. If the right-of-way becomes recolonized by these plant species, the species may be directly affected by operation and maintenance in a similar manner as described for construction. California jewelflower, Hoover's spurge, Kern mallow, San Joaquin woolly-threads, and other native vegetation will be allowed to reestablish after construction in areas associated with temporary construction easements from the natural soil seed bank. If operation and maintenance activities occur adjacent to locations where any of these species have recolonized adjacent to the right-of-way, indirect effects similar to those described for construction activities may occur during maintenance activities.

Conservation measures for California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads

Implementation of the proposed conservation measure, such as installation of exclusion fencing, and use of erosion control materials, will reduce adverse effects to California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads during project construction, maintenance, and operations. It is expected that all suitable habitat for the California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads within the project footprint (and 250 feet of the footprint for vernal pool habitat for the Hoover's spurge) will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST.

The FRA and the Authority has proposed to mitigate for the actual permanent loss of occupied habitat for the California jewelflower, the Hoover's spurge, the Kern mallow, and the San Joaquin woolly-threads (as identified by conservation measure #5 for the California jewelflower,

the Hoover's spurge, the Kern mallow, and the San Joaquin woolly-threads) through a combination of (1) acquisition of permittee-responsible mitigation sites within Fresno, Kings, Tulare, and Kern counties that will be protected in perpetuity through conservation easements; and (2) placement of seeds and plant materials at either Pixley National Wildlife Refuge, Allensworth Ecological Reserve/State Historic Park, Kern National Wildlife Refuge, Atwell Island, Alkali Sink Ecological Reserve, Semitropic Ecological Reserve, Kern Water Bank, or other locations approved by the Service under a Service-approved plan as described in conservation measure # 1 for the California jewelflower, the Hoover's spurge, the Kern mallow, and the San Joaquin woolly-threads. These lands will be protected and managed for the conservation of the California jewelflower, Hoover's spurge, Kern mallow, and San Joaquin woolly-threads and provide suitable habitat for these species commensurate with, or better than, habitat lost as a result of the proposed project.

The proposed permittee-responsible mitigation sites identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will be located within core areas identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* and the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 1998 and 2005). The protection of both occupied and suitable habitat within these core areas is identified as important criteria for the delisting and/or recovery of these species. Implementing the mitigation proposal described in the Compensatory Mitigation Plan (FRA and Authority 2012) will preserve and restore suitable habitat in the same recovery area affected by constructing and operating the CHST-FB Project.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

While we are not aware of any specific non-federal actions that are reasonably likely to occur in the 48,452-acre project action area, we believe it is reasonable to assume that land use changes will continue within the project action area that will be more detrimental than beneficial to habitat for the Federally listed species considered in this biological opinion. The Service does not have specific information regarding future non-federal actions within the project action area. However, increased agriculture, urbanization, and human development is reasonably likely to result in increased loss of habitat and a reduction in available food resources to support these species.

Conclusion

San Joaquin kit fox

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of San Joaquin kit fox from the proposed project. However, after reviewing the current status of the San Joaquin kit fox, the environmental baseline for the

action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The project, as proposed, is not likely to restrict or preclude movement among San Joaquin kit fox populations. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the San Joaquin kit fox from incidental take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Tipton kangaroo rat

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of Tipton kangaroo rat from the proposed project. However, after reviewing the current status of the Tipton kangaroo rat, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the Tipton kangaroo rat from incidental take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Central California tiger salamander

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of central California tiger salamander from the proposed project. However, after reviewing the current status of the central California tiger salamander, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the central California tiger salamander from incidental take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Blunt-nosed leopard lizard

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of blunt-nosed leopard lizard from the proposed project. However, after reviewing the current status of the blunt-nosed leopard lizard, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the blunt-nosed leopard lizard from incidental take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Vernal pool fairy shrimp and vernal pool tadpole shrimp

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of the vernal pool fairy shrimp and the vernal pool tadpole shrimp from the proposed project. However, after reviewing the current status of the vernal pool fairy shrimp and the vernal pool tadpole shrimp, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the vernal pool fairy shrimp and the vernal pool tadpole shrimp from incidental take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Valley elderberry longhorn beetle

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of the valley elderberry longhorn beetle from the proposed project. However, after reviewing the current status of the valley elderberry longhorn beetle, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of incidental take anticipated is small relative to the rangewide condition of the species. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the valley elderberry longhorn beetle from incidental

take resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

California jewelflower

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the California jewelflower from the proposed project. However, after reviewing the current status of the California jewelflower, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of adverse effects anticipated will be minimal. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the California jewelflower from adverse effects resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Hoover's spurge

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the Hoover's spurge from the proposed project. However, after reviewing the current status of the Hoover's spurge, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of adverse effects anticipated will be minimal. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the Hoover's spurge from adverse effects resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Kern mallow

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the Kern mallow from the proposed project. However, after reviewing the current status of the Kern mallow, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of adverse effects anticipated will be minimal. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the Kern

mallow from adverse effects resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

San Joaquin woolly-threads

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the San Joaquin woolly-threads from the proposed project. However, after reviewing the current status of the San Joaquin woolly-threads, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-FB Project, as proposed, is not likely to jeopardize the continued existence of this listed species. Based on the proposed project design and all of the conservation measures, the amount of adverse effects anticipated will be minimal. The protection of habitats within the permittee-responsible mitigation sites as identified in the Compensatory Mitigation Plan (FRA and Authority 2012) will minimize the effect on the San Joaquin woolly-threads from adverse effects resulting from permanent habitat loss. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the FRA so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The FRA has a continuing duty to regulate the activity covered by this incidental take statement. If the FRA: (1) fails to assume and implement the terms and conditions or (2) fails to require the FRA and the Authority, and all of its contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of the incidental take the FRA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Amount or Extent of Take

San Joaquin kit fox

It is not possible to quantify the number of individual San Joaquin kit foxes that will be taken as a result of the proposed project because this species is relatively sparsely distributed and we believe that the number of individuals foxes impacted will be relatively small. Therefore, the amount of habitat for this species that will be impacted as a result of the CHST-FB Project will be used as a surrogate for quantifying take. The Service anticipates that any San Joaquin kit foxes that may be in the section of the action area undergoing construction at any given time, a total area of 11,941 acres (including the project footprint, areas within 200 feet of the project footprint, and the 405-acre FCMS) will be harassed by project activities in areas undergoing construction, operations, and maintenance activities which will result in the likelihood of injury by annoying foxes to such an extent as to significantly disrupt normal behavior patterns. In addition, the Service anticipates that 755 acres of highly suitable habitat will be directly impacted and permanently lost as a result of the CHST-FB Project alignment resulting in harm to the species by significantly impairing essential behaviors, including breeding foraging, and denning. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the CHST-FB Project in the form of harassment over 11,941 acres, and harm of the San Joaquin kit fox caused by the loss of 755 acres of highly suitable habitat, will become exempt from the prohibitions described under section 9 of the Act.

Tipton kangaroo rat

It is not possible to quantify the number of individual Tipton kangaroo rats that will be impacted as a result of the proposed project because the number of individuals within the project action area is unknown. The anticipated loss of individuals of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in their habitat, or additional environmental disturbances. Therefore, the amount of habitat for this species that will be impacted as a result of the CHST-FB Project will be used as a surrogate for quantifying take. The Service anticipates that up to 453.85 acres of suitable habitat for the Tipton kangaroo rat will be permanently lost as a result of the CHST-FB Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-FB Project in the form of harm, harassment, capture, injury, and death of the Tipton kangaroo rat caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Central California tiger salamander

It is not possible to quantify the number of individual central California tiger salamanders that will be impacted as a result of the proposed project because the number of individuals within the project action area is unknown. The anticipated loss of individuals of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in their habitat, or additional environmental disturbances. Therefore, the amount of habitat for this species that will be impacted as a result of the CHST-FB Project will be used as a

surrogate for quantifying take. The Service anticipates that up to 18.7 acres of upland habitat and 18.3 acres of aquatic habitat for the central California tiger salamander will be permanently lost as a result of the CHST-FB Project. Temporary effects of construction activities associated with proposed habitat restoration within the 405-acre FCMS may result in harassment of central California tiger salamanders. Some individuals may suffer mortality during construction activities associated with proposed habitat restoration. Individuals may also be subject to harm and harassment if they are captured and relocated outside of the Vernal Pool Preservation Area during inoculum collection or the Vernal Pool Restoration Area during land contouring. In addition, permanent loss of 10 acres of upland habitat that will be converted to vernal pool habitat at the FCMS. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-FB Project in the form of harm, harassment, capture, injury, and death of the central California tiger salamander caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Blunt-nosed leopard lizard

It is not possible to quantify the number of individual blunt-nosed leopard lizards that will be impacted as a result of the proposed project because the number of individuals within the project action area is unknown. The anticipated loss of individuals of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in their habitat, or additional environmental disturbances. Therefore, the amount of habitat for this species that will be impacted as a result of the CHST-FB Project will be used as a surrogate for quantifying take. The Service anticipates that up to 98.06 acres of suitable habitat for the blunt-nosed leopard lizard will be permanently lost as a result of the CHST-FB Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-FB Project in the form of harm, harassment, capture, injury, and death of the blunt-nosed leopard lizard caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Vernal pool fairy shrimp and vernal pool tadpole shrimp

It is not possible to quantify the number of individual vernal pool fairy shrimp and vernal pool tadpole shrimp that will be taken as a result of the proposed project. The anticipated loss of individuals of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their vernal pool habitat, or additional environmental disturbances. Therefore, the quantity of acres of habitat for this species impacted by the project will be used as a surrogate for quantifying take. The Service anticipates that up to 29.77 acres of vernal pool habitat suitable for vernal pool fairy shrimp and 0.0041 acre of vernal pool habitat suitable for vernal pool tadpole shrimp will be permanently lost as a result of the CHST-FB Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-FB Project in the form of harm, harassment, capture, injury, and death of the vernal pool fairy shrimp and vernal pool tadpole shrimp caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Valley elderberry longhorn beetle

It is not possible to quantify the number of individual valley elderberry longhorn beetles will be taken as a result of the proposed project. The anticipated loss of individuals of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in their habitat, or additional environmental disturbances. Therefore, the number of elderberry shrubs that will be impacted will be used as a surrogate for quantifying take. The Service anticipates that up to 36 elderberry shrubs for the valley elderberry longhorn beetle will be permanently lost as a result of the CHST-FB Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-FB Project in the form of harm, harassment, capture, injury, and death of the valley elderberry longhorn beetle caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service has determined this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, the Tipton kangaroo rat, the central California tiger salamander, the blunt-nosed leopard lizard, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, and the valley elderberry longhorn beetle.

Reasonable and Prudent Measure

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize and avoid effects of the CHST-FB Project on the San Joaquin kit fox, the Tipton kangaroo rat, the central California tiger salamander, the blunt-nosed leopard lizard, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, and the valley elderberry longhorn beetle:

All of the conservation measures as proposed by the FRA and the Authority in the biological assessment, and restated in the project description section of this biological opinion, must be fully implemented and adhered to.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FRA and the Authority must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The FRA and the Authority shall ensure that the FRA and the Authority and all of its contractors fully implement and adhere to the proposed conservation measures. All terms and conditions that apply to contractor activities shall be conditioned in contracts for the work.

2. In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the FRA and the Authority shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the FRA and the Authority must immediately reinitiate formal consultation as per 50 CFR 402.16.

    a. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the FRA and the Authority shall provide monthly updates to the Service with a precise accounting of the total acreage when the following habitats are impacted: (1) habitat for the San Joaquin kit fox (Table 4) (2) habitat for the Tipton kangaroo rat (Table 5); (3) upland habitat for the California tiger salamander (Table 5); (4) habitat for the blunt-nosed leopard lizard (Table 5); (5) vernal pool habitat for vernal pool species (Table 5); and (6) actual number of elderberry shrubs and stems for the valley elderberry longhorn beetle (Table 5). Updates shall also include any information about changes in project implementation that result in habitat disturbance not described in the *Description of the Proposed Action* and not analyzed in this biological opinion.

    b. For those components of the action that may result in direct encounters between listed wildlife species and project workers and their equipment whereby incidental take in the form of harassment, harm, injury, or death is anticipated, the FRA and the Authority shall immediately contact the Service's SFWO at (916) 414-6600, to report the encounter. If an encounter occurs after normal working hours, the FRA shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the FRA shall follow the steps outlined in the *Salvage and Disposition of Individuals* section.

    c. A post-construction report detailing compliance with the project design criteria and proposed conservation measures described under the *Description of the Proposed Action* section of this biological opinion shall be provided to the Service within 30 calendar days of completion of the project. The report shall include: (1) dates of project groundbreaking and completion; (2) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (3) an explanation of failure to meet such measures, if any; (4) known project effects listed species, if any; (5) observed incidences of injury to or mortality of any listed species, if any; and, (6) any other pertinent information.

3. The FRA and the Authority will submit a final Compensatory Mitigation Plan to the Service prior to initiation of construction of the CHST-FB Project. In addition, prior to commencement of construction for any phase, the FRA will provide a phase specific final mitigation plan that implements mitigation consistent with the Compensatory Mitigation Plan (Authority 2012), and identifies long term management measures, appropriate conservation instruments, and appropriate financial assurances (e.g., proof of credit purchase from Service-approved conservation banks) to the Service for each phase of construction. The FRA will also submit all proposed conservation easements or similar instruments, management plans,

and financial assurances to the Service for review and approval prior to initiation of construction activities.

4. The FRA and the Authority will submit a final Fagundes Compensatory Mitigation Proposal to the Service for review and approval by the Service that will include performance standards/success, contingency planning, performance monitoring requirements, and an LTMP. Performance monitoring success criteria will ensure adaptive management action will be taken if performance criteria are not met.

Salvage and Disposition of Individuals

In the case of an injured and/or dead federally listed wildlife species, the Service shall be notified of events within one day and the animal shall only be handled by a Service-approved biologist. Injured federally listed wildlife species shall be cared for by a licensed veterinarian or other qualified person. In the case of a dead federally listed wildlife species, the animal shall be preserved, as appropriate, and shall be bagged and labeled (i.e. species type; who found or reported the incident; when the report was made; when and where the incident occurred; and if possible, cause of death). Carcasses shall be held in a secure location, such as a freezer or cooler, until instructions are received from the Service regarding the disposition of the specimen or until the Service, or another appropriate agency or qualified person, takes custody of the specimen. The FRA must report to the Service within one calendar day any information about take or suspected take of federally-listed species not exempted in this opinion. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. The Service contacts are Daniel Russell, Deputy Assistant Field Supervisor, Endangered Species Program, Sacramento, at (916) 414-6600 and the Service's Law Enforcement Division at (916) 414-6660.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Service recommends the FRA develop and implement the appropriate restoration measures in areas designated in the *Valley Elderberry Longhorn Beetle Recovery Plan* (Service 1984), *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998), and the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005c).

2. The FRA and the Authority should incorporate "environmentally friendly" erosion and stabilization techniques whenever possible in this project, such as use of biodegradable materials constructed from natural fibers (e.g. coconut fiber).

3. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFW. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the CHST-FB Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding the revised biological opinion on the proposed California High-speed Rail Train system: Fresno to Bakersfield Section Project, please contact Florence Gardipee, Senior Fish and Wildlife Biologist, (Flo_Gardipee@fws.gov), or Thomas Leeman, San Joaquin Valley Division Chief, of this office at (916) 414-6600, or by email.

Sincerely,

Jennifer M. Norris
Field Supervisor

cc:
Stephanie Perez, Federal Rail Administration, Washington, D.C.
Kathleen A. Dadey, U.S. Army Corps of Engineers, Sacramento, California
Sarvy Mahdavi, Environmental Protection Agency, San Francisco, California
Enrique Manzanilla, Environmental Protection Agency, San Francisco, California
Julie Vance, California Department of Fish and Wildlife, Bakersfield, California
Mark McLoughlin, Sacramento, California High Speed Rail Authority
Stephanie Parsons, Parsons-Brinckerhoff, Sacramento, California

LITERATURE CITED

Allendorf, F.W. and G. Luikart. 2007. Conservation and Genetics of populations. Blackwell Publishing, Oxford, UK.

Anderson, J.D. 1968. Comparison of the food habits of *Ambystoma macrodactylum sigillatum*, *Ambystoma macrodactylum croceum*, and *Ambystoma tigrinum californiense*. Herpetologica 24(4):273-284.

Anderson, P.R. 1968. The reproductive and developmental history of the Central California tiger salamander. Master's thesis, Department of Biology, Fresno State College, Fresno, California. 82pp.

Arizona Game and Fish Department. 2006. Guidelines for Culvert Construction to Accommodate Fish & Wildlife Movement and Passage. Habitat Branch. Available at http://www.azgfd.gov/hgis/pdfs/CulvertGuidelinesforWildlifeCrossings.pdf.

Barry, S.J. and H.B. Shaffer. 1994. The status of the Central California tiger salamander (*Ambystoma californiense*) at Lagunita: A 50-year update. Journal of Herpetology 28(2):159-164.

Bjurlin, C.D., B.L. Cypher, C.M Wingert, and C.L. Van Horn Job. 2005. Urban roads and the endangered San Joaquin kit fox. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, CA.

Bradley, C.A. and S. Altizer. 2006. Urbanization and the ecology of wildlife diseases. Trends in Ecology and Evolution 22:95-102.

Berry, W.H., WG. Standley, T.P. O'Farrell, and T.T. Kato. 1992. Effects of military-authorized activities on the San Joaquin kit fox (*Vulpes velox macrotis*) at Camp Roberts Army National Guard Training Site, California. U. S. Department of Energy Topical Report No. EGG 10617-2159, EG&G/EM Santa Barbara Operations, National Technical Information Service, Springfield, Virginia.

Bremner-Harrison, S., B.L. Cypher, C.M. Fiehler, A.P. Clevenger, and D. Hacker. 2007. Use of highway crossing structures by kit foxes. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, CA.

Burgland, B. and T. Lindvall. 1995. Effects of community noise. Archives of the Center for Sensory Research 2:1-195.

Burton, D.L. and K.A. Doblar. 2004. Morbidity and mortality of urban wildlife in the Midwestern United States. Proceedings 4th International Wildlife Symposium.

California Department of Fish and Wildlife. [CDFW] California Department of Fish and Game. 1999. Exposure of Non-target Wildlife to Anticoagulant Rodenticides in California. Robert C. Hosea. California Department of Fish and Game Pesticide Investigations Unit. Rancho Cordova, California.

_____ 2013. California Natural Diversity Database. Natural Heritage Division. Sacramento, California.

California Irrigation Management Information System (CIMIS). 1999. "Reference EvapoTranspiration Zones." Developed by the California Department of Water Resources and the University of California, Davis. Sacramento, CA: Department of Water Resources, 1999. http://wwwcimis.water.ca.gov/cimis/pdf/etomap1.pdf (accessed August 2012).

Clevenger, A.P., A.V. Kociolek, and B.L. Cypher. 2010. Effects of four-lane highways on desert kit fox and swift fox: Inferences for the San Joaquin kit fox population. Western Transportation Institute, Montana State University, Bozeman.

Cummings, K., J. Glover, and B. Sun. 2009. Epidemiologic summary of animal and human rabies in California, 2001-2008. California Department of Public Health, Center for Infectious Diseases, Division of Communicable Disease Control Infectious Diseases Branch-Surveillance and Statistics Section.

Cypher, B.L., J.H. Scrivner, K.L. Hammer, and T.P. O'Farrell. 1998. Viral antibodies in coyotes from California. Journal of Wildlife Diseases 34:259-264.

Cypher, B.L., S.E. Phillips, and P.A. Kelly. 2013. Quantity and distribution of suitable habitat for endangered San Joaquin kit foxes: conservation implications. Canid Biology and Conservation 16:25-31.

Cypher, B.L., T. L. Westall, C.L. Van Horn Job, and E.C. Kelly. 2014. San Joaquin kit fox conservation in a satellite habitat area. Unpublished report, California State University-Stanislaus, Endangered Species Recovery Program, Turlock, California.

Feaver, P.E. 1971. Breeding pool selection and larval mortality of three California amphibians: *Ambystoma tigrinum californiense* Gray, *Hyla regilla* Baird and Girard and *Scaphiopus hammondi hammondi* Girard. Master's thesis, Department of Biology, Fresno State College, Fresno, California

Fitzpatrick, B.M. and H.B. Shaffer. 2004. Environmental-dependent admixture dynamics in a tiger salamander hybrid zone. Evolution 58(6):1282-1293.

Gerhardt, F. and S.K. Collinge. 2003. Exotic plant invasions of vernal pools in the Central Valley of California, USA. Journal of Biogeography 30:1043-1052.

Germano, D.J. 2010. Survivorship of translocated kangaroo rates in the San Joaquin Valley, California. California Fish and Game 96:82-89.

Gilpin, M. E. and M. E. Soulé. 1986. "Minimum viable populations: processes of species extinction." Pages 18-34 *in* M. E. Soulé (editor). Conservation Biology: The Science of Scarcity and Diversity. Sinauer Associates, Inc.; Sunderland, Massachusetts.

Hosea, R.C. 2000. Exposure of non-target wildlife to anticoagulant rodenticides in California. California Department of Fish and Game Pesticide Investigations Unit, Rancho Cordova, California.

Holland, R.F. 1998. Changes in the Great Valley Vernal Pool Distribution from 1989 to 1997. California Department of Fish and Game, Sacramento, California. 18 pages.

_____ 2003. Distribution of vernal pool habitats in five counties of California's southern coast range. California Department of Fish and Game, Sacramento, California. 23 pages.

Keeler-Wolf, T., D.R. Elam, K. Lewis, and S.A. Flint. 1998. California vernal pool assessment preliminary report. California Department of Fish and Game.

Live Oak Associates, Inc. (LOA). 2001. Proposed Fagundes Mitigation Bank. Report provided by John Fagundes, landowner, by email to Mark McLoughlin, California High-Speed Rail Authority, July 25, 2012.

Loredo, I., and D. Van Vuren. 1996. Reproductive ecology of a population of the Central California tiger salamander. Copeia 1996(4):895-901.

Loredo, I., D. Van Vuren and M.L. Morrison. 1996. Habitat use and migration behavior of the Central California tiger salamander. Journal of Herpetology 30(2):282-285.

Mills, L.S. 2007. Conservation of wildlife populations: Demography, genetics, and management. Blackwell Publishing, Malden, Massachusetts.

Morey, S.R. 1998. Pool duration influences age and body mass at metamorphosis in the western spadefoot toad: implications for vernal pool conservation. Pages 86-91 *in* C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren Jr., and R. Ornduff (editors). Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. California Native Plant Society. Sacramento, California. 1998.

Natural Resources Conservation Service (NRCS). 2012a. "Web Soil Survey." Washington, DC: United States Department of Agriculture, last updated February 17, 2012. http://websoilsurvey.nrcs.usda.gov/ (accessed August 2012).

Ng, S.J., J.W. Dole, R.M. Sauvajot, S.P.D. Riley, and T.J. Valone. 2004. Use of highway undercrossings by wildlife in southern California. Biological Conservation 1115:499-507.

Orman, L. and Phillips, S.E. 2011. Cataloging protected lands in the San Joaquin Valley using geographic information systems. California State University-Stanislaus, Endangered Species Recovery Program, Turlock.

Pechmann, J.H.K., D.E. Scott, J.W. Gibbons, and R.D. Semlitsch. 1989. Influence of wetland hydroperiod on diversity and abundance of metamorphosing juvenile amphibians. Wetlands Ecology and Management 1:3-11.

Randall, J.A. 1997. Species-specific Footdrumming in Kangaroo Rats: *Dipodomys ingens, D. deserti, D. spectabilis*. Animal Behavior 54:1167-1175.

Randall, J.A. and E.R. Lewis. 1997. Seismic communication between the burrows of kangaroo rats, *Dipodomys spectabilis*. Journal of Comparative Physiology 181:525-531.

Randall, J.A. 2001. Evolution and Function of Drumming as Communication in Mammals. American Zoology 41:1143-1156.

Rains, M.C., G.E. Fogg, T. Harter, R. A. Dahlgren, and R. J. Williamson. 2006. The role of perched aquifers in hydrological connectivity and biogeochemical processes in vernal pool landscapes, Central Valley, California. Hydrological Processes 20:1157-1175.

Rains, M.C., R.A. Dahlgren, G. E. Fogg, T. Harter, and R.J. Williamson. 2008. Geological control of physical and chemical hydrology in California vernal pools. Wetlands 28:347-362.

Riley, S.P.D., J. Foley, and B. Chomel. 2004. Exposure to feline and canine pathogens in bobcats and gray foxes in urban and rural zones of a national park in California. Journal of Wildlife Diseases 40:11-22.

Schwartz, M.K., Luikart, G., and R.S. Waples. 2007. Genetic monitoring as a promising tool for conservation and management. Trends in Ecology and Evolution 22:25-33.

Scott, D.E. 1994. The effect of larval density on adult demographic traits in *Ambystoma opacum*. Ecology 75:1383-1396.

Semlitsch, R.D., D.E. Scott, and J.H.K. Pechmann. 1988. Time and size at metamorphosis related to adult fitness in *Ambystoma talpoideum*. Ecology 69:184-192.

Shaffer, M.L. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 *in* M.E. Soulé (editor). Viable populations for conservation. Cambridge University Press, New York, New York.

Shaffer, H.B., R.N. Fisher, and S.E. Stanley. 1993. Status report: the Central California tiger salamander (*Ambystoma californiense*). Final report for the California Department of Fish and Game.

Shaffer, H.B., G.B. Pauly, J.C. Oliver, and P.C. Trenham. 2004. The molecular phylogenetics of endangerment: cryptic variation and historic phylogeography of the Central California tiger salamander, *Ambystoma californiense*. Molecular Ecology 13:3033-3049.

Shaffer, H.B. and P.C. Trenham. 2002. Distinct population segments of the California tiger salamander, *Ambystoma californiense*. Unpublished report.

Shaffer, L. A. and G. R. Long. 2004. Low-frequency Distortion Product Otoacoustic Emissions in Two Species of Kangaroo Rats: Implications for Auditory Sensitivity. Journal of Comparative Physiology 190:55-60.

Soulé, M.E. and L.S. Mills. 1998. No need to isolate genetics. Science 282:1658-1659.

Spencer, W.D., P. Beier, K. Penrod, K. Winters, C. Paulman, H. Rustigian-Romsos, J. Strittholt, M. Parisi, and A. Pettler. 2010. California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration. Sacramento, CA. February 2010.

Standley, W.G., W.H. Berry, T.P. O'Farrell, and T.T. Kato. 1992. Mortality of San Joaquin kit fox (*Vulpes macrotis mutica*) at Camp Roberts Army National Guard Training Site, California. U. S. Department of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. EGG 10617-2157.

Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Houghton Mifflin Company Boston, Massachusetts.

Stebbins, J.C., W. Trayler, and R. Kokx. 1995. Unpublished report. Habitat characterization study of San Joaquin Valley vernal pools, final report. Submitted to the California Department of Fish and Game, October 31, 1995.

Stebbins, J.C., J.R. Brownell, W. Trayler. 1996. Unpublished report. Effective mitigation techniques for Central Valley vernal pools, final report. Submitted to the California Department of Fish and Game, September 1, 1996.

Storer, T.I. 1925. A synopsis of the amphibia of California. University of California Publications in Zoology 27:1-342.

Trenham, P. 1998a. Radiotracking information. University of California, Davis, California.

_____ 1998b. Demography, migration, and metapopulation structure of pond breeding salamanders. Ph.D. dissertation. University of California, Davis, California.

_____ 2001. Terrestrial habitat use by adult Central California tiger salamanders. Journal of Herpetology 35:343-346.

Trenham, P.C., W.D. Koenig, and H.B. Shaffer. 2001. Spatially autocorrelated demography and interpond dispersal in the salamander *Ambystoma californiense*. Ecology 82:3519-3530.

Trenham, P.C., and H.B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. Ecological Applications 15:1158–1168.

Trenham, P.C., H.B. Shaffer, W.D. Koening and M.R. Stromberg. 2000. Life History and Demographic variation in the CTS (*Ambystoma californiense*). Copeia 2000(2):365-377.

Twitty, V.C. 1941. Data on the life history of *Ambystoma tigrinum californiense* Gray. Copeia 1941 (1):1-4.

Uptain, C. 1985. Mark-Recapture Population Estimates and Visitation indices for the Blunt-Nosed Leopard Lizard, *Gambelia sila*, at the Pixley National Wildlife Refuge. U.S. Fish and Wildlife Service, Delano, California.

U.S. Fish and Wildlife Service. 1984. Valley elderberry longhorn beetle recovery plan. Portland, Oregon. 70 pp.

_____ 1988. Endangered and threatened wildlife and plants; determination of endangered status for the Tipton kangaroo rat: final rule. Federal Register 53(131):25608-25611.

_____ 1998. Recovery plan for upland species of the San Joaquin Valley, California. Portland, Oregon. 319 pp.

_____ 2003a. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Sonoma County Distinct Population Segment of the Central California tiger salamander; Final Rule. Federal Register 68:13497.

_____ 2003b. Endangered and Threatened Wildlife and Plants; Listing of the Central California Distinct Population Segment of the Central California tiger salamander; Reclassification of the Sonoma County and Santa Barbara County Distinct Populations From Endangered to Threatened; Special Rule. Federal Register 68:28648.

_____ 2003c. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Final Rule. Federal Register 68:46684

_____ 2004. Endangered and threatened wildlife and plants; determination of threatened status for the Central California tiger salamander; and special rule exemption for existing routine ranching activities; final rule. Federal Register 69:47212-47248.

_____ 2005a. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Central California tiger salamander, Central Population; Final Rule. Federal Register 70:49379.

_____ 2005b. *Kern and Pixley National Wildlife Refuges Final Comprehensive Conservation Plan*. February 2005. Available from web site, http://library.fws.gov/CCPs/kern-pixley_final.pdf.

_____ 2005c. Recovery plan for vernal pools ecosystems of California and Southern Oregon. Portland, Oregon. 606 pp.

_____ 2006a. Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), 5-Year Review: Summary and Evaluation. September 2006.

_____ 2006b. Transmittal of guidance: Estimating effects of auditory and visual disturbance to northern spotted owls and marbled murrelets in northwestern California. Arcata Fish and Wildlife Office, Arcata, California.

_____ 2007a. Vernal Pool Fairy Shrimp (*Branchinecta lynchi*), 5-Year Review: Summary and Evaluation. September 2007.

_____ 2007b. Vernal Pool tadpole Shrimp (*Lepidurus packardi*), 5-Year Review: Summary and Evaluation. September 2007.

_____ 2009a. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Sonoma County Distinct Population Segment of Central California tiger salamander (*Ambystoma californiense*); Proposed Rule. Federal Register 74:41662-41672.

_____ 2009b *Chamaesyce hooveri* (Hoover's spurge) 5-Year Review: Summary and Evaluation. January 2009.

_____ 2010a. San Joaquin kit fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation. February 2010.

_____ 2010b. Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) 5-Year Review: Summary and Evaluation. February 2010.

_____ 2010c. Blunt-nosed leopard lizard (*Gambelia sila*) 5-Year Review: Summary and Evaluation. February 2010.

_____ 2010d. *Monolopia* (= *Lemberta*) *congdonii* 5-Year Review: Summary and Evaluation. June 2010.

_____ 2011a. U.S Fish and Wildlife Service standardized recommendations for protection of the San Joaqion kit fox prior to or during disturbance. Sacramento Fish and Wildlife Office, Sacramento, California.

_____ 2011b. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Sonoma County Distinct Population Segment of Central California tiger salamander; Final Rule. Federal Register 76:54346-54672.

Van Hattem, M.G. 2004. Underground ecology and natural history of the CTS. Master of Science thesis. San Jose State University, San Jose, California.

Western Region Climate Center (WRCC). 2010. Historical Climate Information Program. Available on Web: http://www.wrcc.dri.edu/CLIMATEDATA.html. Accessed July 15, 2010.

_____ 2012. "Climate Summaries." Reno, NV: National Oceanic and Atmospheric Administration, WRCC, 2012. http://www.wrcc.dri.edu/climate-summaries/ (accessed September 2012).

White, P.J., and K. Ralls. 1993. Reproduction and spacing patterns of kit foxes relative to changing prey availability. Journal of Wildlife Management 57:861-867.

White, P.J., K. Ralls, and C.A. Vanderbilt. 1995. Overlap in habitat and food use between coyotes and San Joaquin kit foxes. Southwestern Naturalist 40:342-349.

Wilbur, H.M. and J.P. Collins. 1973. Ecological aspects of amphibian metamorphosis. Science (n.s.) 182(4119):1305-1314.

Williamson, R.J., G.E. Fogg, M.C. Rains, and T.H. Harter. 2005. Hydrology of vernal pools at three sites, Southern Sacramento Valley: Final technical report for project F 2001 IR 20, Developing a floristic statewide vernal pool classification, and a functional model of pool hydrology and water quality. Department of Land, Air and Water Resources, Hydrological Sciences Graduate Group, University of California, Davis, 89 pp.

In Litteris

Cypher, Brian. 2010. Associate Director and Research Ecologist, California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California. Memo: Comments and thoughts on habitat connectivity and crossing structures for San Joaquin kit foxes associated with the High-Speed Train Project in the San Joaquin Valley.

_____ 2011. Associate Director and Research Ecologist, California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California. Memo: Responses to queries forwarded by Matthew Bettelheim, URS, on February 28, 2011.

_____ 2013. Associate Director and Research Ecologist, California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California. Memo: Assessment of the use of agricultural lands by San Joaquin kit foxes, February 7, 2013.

_____ 2013. Associate Director and Research Ecologist, California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California. Memo: Assessment of adequacy of proposed crossing structures for San Joaquin kit foxes in the Biological Assessment for the Fresno to Bakersfield segment of the California High-speed Train, February 9, 2013.

Personal communications

Cypher, B.L. 2012. Associate Director and Research Ecologist Endangered Species Recovery Program, California State University-Stanislaus, Bakersfield, California. Telephone conversations and email correspondence with Florence Gardipee, U.S. Fish and Wildlife Service, Sacramento, California, regarding status of San Joaquin kit fox populations, infectious disease threats for San Joaquin kit foxes, and issues related to wildlife crossing structures for this species.

_____ 2013. Associate Director and Research Ecologist Endangered Species Recovery Program, California State University-Stanislaus, Bakersfield, California. Telephone conversations and email correspondence with Florence Gardipee, U.S. Fish and Wildlife Service, Sacramento, California, regarding suitability of agricultural lands for use by San Joaquin kit fox populations in Fresno, Kings, Tulare and Kern Counties, and issues related to wildlife crossing structures for this species.

Wilbert, T.. Ph.D. Candidate and J.E. Maldonado Research Geneticist. 2012. Smithsonian Conservation Biology Institute, Center for Conservation and Evolutionary Genetics, Washington D.C. Telephone conversations and email correspondence with Florence Gardipee, U.S. Fish and Wildlife Service, Sacramento, California, regarding genetic studies of the San Joaquin kit fox.